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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

Before The Honorable William H. Orrick, Judge

HUAWEI TECHNOLOGIES, CO, LTD,)
et al.,)
)
Plaintiffs,)
)
VS.) NO. C 16-02787 WHO
)
SAMSUNG ELECTRONICS CO, LTD,)
et al,)
)
Defendants.)
_________________________________)

San Francisco, California
Monday, August 7, 2017

TRANSCRIPT OF PROCEEDINGS

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Monday - August 7, 2017 **9:00 a.m.**

P R O C E E D I N G S

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THE CLERK: And we are here in Case Number 16-2787 Huawei Technologies Company, LTD versus Samsung Electronics Company.

Counsel, please come forward and state your appearance.

MR. BETTINGER: Good morning, Your Honor. Mike Bettinger along with my colleagues Doug Lewis, John McBride, and Irene Yang for Plaintiff Huawei.

THE COURT: Welcome.

MR. BETTINGER: Thank you.

MR. VERHOEVEN: Good morning, Your Honor. Charles Verhoeven on behalf of Samsung, and with me is Alan Whitehurst, Ray Zado, Deepa Acharya, and Marissa Ducca.

THE COURT: Great. Welcome.

MR. VERHOEVEN: Thank you.

THE COURT: All right. So we're here for the tutorial. One thing I wanted to say before I forgot it is with respect to the claim construction hearing, I saw that you thought that it might take four hours. It won't, in case you were wondering.

(Laughter)

We will absolutely be done by 11:30. And the -- I'm going to give you a tentative construction the day before, which will

hopefully make argument even shorter.

MR. BETTINGER: Yes.

THE COURT: Okay. Good. So Mr. Bettinger, go ahead.

MR. BETTINGER: Yes. And just as a matter of procedure, Your Honor, the way -- we've spoken with counsel -- we thought we'd give you a little overview of the technology, and then get a little more specific with each of the five Huawei patents; and to the extent counsel has response to that, they would provide that; then they would do the same for the Samsung patents; then to the extent we had a response, we would provide that.

THE COURT: Great.

MR. BETTINGER: We thought that made an efficient way to go about it, so...

THE COURT: That makes a lot of sense.

MR. VERHOEVEN: We agreed on that.

Just so we can make sure we have the right timing, we were assuming a three-hour limit; is that about --

THE COURT: Oh, I think -- yes, and if you wanted to make it faster, that would be --

(Laughter)

MR. VERHOEVEN: We'll try. We'll try, Your Honor.

THE COURT: My attention span just is more limited than you might guess, so I'd do it expeditiously.

MR. VERHOEVEN: Thank you, Your Honor.

THE COURT: All right.

MR. BETTINGER: If it please the Court, we do have a slide presentation, and we have the printouts of those to follow along.

THE COURT: Excellent.

MR. BETTINGER: Thank you.

Good morning, Your Honor. On behalf of Huawei, I might also add that a number of folks from the Huawei team are present both from China and the U.S. operations.

THE COURT: Excellent. Welcome, all.

MR. BETTINGER: Thank you. Just as a matter of introduction, Your Honor, just with respect to Huawei and the patents that are at issue -- if we could go to that next slide, Alan -- Huawei, for background, is the world's largest telecommunications equipment manufacturer. Worldwide it is third in mobile devices. It invests heavily in R&D, in 2016 alone, $11 million -- billion. Worldwide, 45 percent of its workforce is related to R&D, and that's particularly relevant because here in the U.S -- and that's a picture of the Huawei facilities down in Santa Clara -- there are 700 of the R&D engineers and scientists here in the U.S.

Since 2013, Huawei has had more contributions to that 4G, which is fourth generation, LTE long-term evolution, that's standard for telecommunications equipment. I mention that because it is those patents that will be at issue today,

patents that have been contributed to the LTE standard by Huawei.

And there's some acronyms, so at the back of the book we did provide a glossary, because this -- we don't get into the Core Network here, but when you get into that, it is alphabet soup. So we've tried to give you terms that may come up today as a helpful guide.

THE COURT: Great.

MR. BETTINGER: To add to that list there's what's called "ETSI," that's the standard group, the European Telecom Standards Institute, which kind of governs the whole standards process.

And so Huawei has offered its patents, as we laid out in our complaint, on FRAND terms. We have entered into licenses with a number of companies in the telecommunications space, including Apple. We have been in negotiations now for five years with Samsung and have not reached any kind of agreement, which brings us to the Court today.

So, if we could hit the next slide, Alan, please.

At a very basic level -- and I'll give you some overview and then others will get into it in more detail. With 4G LTE technology, we had all of a sudden wanting to provide Internet-like services to mobile devices in the field. So you needed Broadband, there was a lot of data, a lot of information had to be conveyed now to mobile devices in the field, which

was different than previous generations. And those -- the basic way that was done is through a cell. In 4G, the cell can be up to a hundred kilometers in diameter, 62 miles. They could be as small as maybe 20 feet in a little picocell. So the size of cells, range, matters, and it can be quite large in 4G. As a result, that adds to the complications that are addressed by some of the patents that I want to give you a high level overview for.

At a basic level, information is transmitted between the mobile device, which you'll hear referred to as a UE, or user equipment, to a cell tower through radio waves. That process is sometimes you'll hear the acronym RAN, for Radio Access Network, and that's that communication between the user equipment and the cell tower.

At the base of the cell tower there is a base station. That's kind of command central. It receives and throws it out into the Core Network, which is really not at issue for today's technology. But the base station in 4G, it's called an "eNodeB." The "B," I think, goes back to being an abbreviation for base station, and so that was the node on the transmission network that would collect the information and send it to the Core Network. In 4G, it's eNodeB; in 3G it's just called "NodeB." The "E" stands for evolve, and that's the technology that you'll be hearing about. And, again, the focus of these patents is going to be that communication for the most part

between the UE, the user equipment, and the cell tower, back and forth it goes on.

If we could go to the next cell.

So the first level of complication is that there are many cells, and there are many UEs within those cells. And the cells are depicted here as being separate, but in reality they overlap. They overlap, and they can be on top of each other and in different areas. So when a UE is in one cell, there's an issue that comes up: Well, what base -- what cell tower do you connect to, and how do you do that? And what if that's no good, that connection is no good, how do you move to another one? When you think through those problems, it gets fairly complex, and as the number of cells increase with the UEs, it adds to the complexity of that particular problem.

On top of that -- if we could go to the next slide -- is the UEs move from one cell to the next, and so when you move, there's these handover issues. You've got to get all that information that's been going to a base station now to a new base station, and it's got to know the UEs in its cell, and can communicate effectively with usually thousands, tens of thousands of other units that may be in that cell. So the complexity is increased.

If we go to the next slide, and the next level of complexity, it's one thing to move from a 4G LTE cell to another 4G LTE cell. The equipment is the same, the handoff is

a little easier. But life is not so simple, and sometimes you end up having to go to what's called a "legacy cell," so 2G and 3G. Those are still systems that are in use today. Sometimes in rural areas they're more prevalent today. But perhaps when you get texts -- the plane lands and you're taxiing into the gate, sometimes you'll see 3G comes up, because the 4G is overloaded, and you get kicked over to a 3G network. So there the equipment is different. Mr. McBride in particular will be describing that, the different equipment between 4G and 3G, and how you make sure that all the information you have from 4G is transmitted over to 3G, so there can still be communication.

If we go to the next slide then.

What you'll hear a lot about today is this notion of the uplink and the downlink. And the uplink is communication from the UE, or the phone, to the cell tower base station; and the downlink is the reverse, sending messages back and forth. Even though those are radio signals -- they go out as radio signals -- we've depicted them as arrows for purposes of illustrating for ease of the Court today.

Both the uplink and the downlink at a basic level have control signals, kind of tell you what to do, and user data, the actual packets if something from a web site is coming across, similarly with the downlink sending that down to the UEs, same thing, control signals and user data. It gets fairly complex as to how those uplinks and downlinks work, and they'll

get into it in more detail today. But at a basic level, that's what we're talking about.

If we could go to the next slide.

So the structure of that communication in the uplink and the downlink, if you break it down, across the top we show time. So this is time going from the UE to the base station. You start out with what are called "radio frames," and then within each frame there is a subframe. That radio frame is ten milliseconds long, ten milliseconds, which is -- one is 1/1000th of a second, so the subframe -- each subframe is one millisecond. And then you'll hear that the subframes are actually divided into slots, which makes that one millisecond, or 1/1000th of a second, and then it actually further breaks down from there. So from a time standpoint a slot can have 1/1000th of a second from a time standpoint, so you could imagine the amount of back and forth that's going on when you get down to the level of a slot to put information in to send it back and forth between a UE and a base station. So the complexities and the speed are things that are in a different dimension almost than we're used to in everyday life.

Adding to that is it's not just a time domain that you're operating in. There's also what's called a "frequency domain." So you have over time, but you have frequencies, because you can divide that Radio Network up into channels and sub channels, so that you'll be combining time with frequency.

And you'll see if we go to the next slide, if we use this as a guide and across the top is time, and down the side is -- call that frequency -- you have to schedule everything that's happening between this base station and the UE. And so if you think of it almost as a TV guide that you can pull up on your screen, if you think of the Fox or CNN, or whatever station has a frequency, it comes in at a particular frequency, and then at a particular time a show will be on on that frequency. So you have both a time and frequency domain, and both have to be taken into account for purposes of uplink and downlink, and the communication between the base station and the UE.

And so that's at a very high level. There's much more complexity below it, but I'm just trying to give you a framework for what you're going to be hearing today.

And so the way we've organized it is my colleague Mr. McBride will address more detail of the '613 and '166 patents. Then Ms. Yang will cover the '197 and give you some more background for that technology; and then Mr. Lewis will do the '278 and '239 patent.

THE COURT: Okay.

MR. BETTINGER: So let me turn it over to them. I appreciate your time.

MR. MCBRIDE: Good morning, Your Honor. John McBride for Huawei.

THE COURT: Good morning.

MR. MCBRIDE: So we'll dive into the '613 patent.

Broadly, the '613 patent relates to downlink communication services that is transmissions from the base station to the UE. In particular the patent discusses -- and I've highlighted it here -- a unicast service and what it calls an MBMS or a multimedia broadcast or multicast service. We'll get into what those are on the next slide.

The concept of unicast is pictured on the left-hand side of the slide. A unicast transmission is one that is sent from one sender and intended for one receiver. There are also transmissions that can be sent to -- from one sender and intended for many receivers. A broadcast transmission is a transmission that is sent from one sender and intended for everyone. And a multicast transmission is one intended for a particular group.

This slide provides some real world examples of unicast and broadcast. On the left we see Alice and Bob. Alice is texting with a friend, and Bob is, I guess, trying to book a room at the Hilton. On the right-hand side -- and those are transmissions that are intended just for Alice and just for Bob. On the right-hand side we have an example of a broadcast. In this case, Alice and Bob have completed their texting and hotel reservations and are now tuned into the Super Bowl, along with Charlie, David and Ellen. Everyone is watching it all live at the same time. The '613 patent is directed to an

efficient way of scheduling these sorts of transmissions between the base station and the UE.

So returning to this TV guide that Mr. Bettinger put up earlier. To really understand how unicast and multicast work in LTE, we need to understand how the base station carves up and allocates the resources both in that time domain and frequency domain. Because as Mr. Bettinger said, there can be many, many UEs in a different cell, say thousands or even tens of thousands. It's very important that the base station can inform the UE when and where, at what time and at what frequency the UE should be listening, because otherwise everyone is listening to what is intended for everyone else.

So to do this, the base station allocates tiny slices of time and frequency for each cell. As Mr. Bettinger said, you can think of the channels as the frequencies, and the time domain as sort of half hour blocks or hour blocks, normal TV, except, of course, in an LTE the slices of time we're talking about are a thousandth of a second.

So just like the channels in the TV guide, the LTE radio spectrum is divided up into a number of component pieces which can be assigned to a different UE at a different slice of time. It is a fairly complicated process and, for the purposes of the '613 patent, we don't really need to get too deeply into the low levels. But we are going to focus on things at the level of those subframes that Mr. Bettinger was talking about.

As he explained earlier, a subframe is a concept that refers to a chunk of the radio spectrum; for example, twelve different pieces each measuring 15 kilohertz in range over a one millisecond slice of time. And what I've tried to do is depict that on this slide with each block being one of those subframes, and each of the subframes can be assigned to a different UE, which I've shown here through color coding. So UE-1 has those subframes in purple, UE-2 in gold, et cetera.

And now this slide just sort of rehashes again what Mr. Bettinger showed earlier, that these subframes compose frames which are each ten subframes in length over one millisecond long.

In LTE, each subframe, each of those little boxes at the bottom, can hold unicast or multicast or broadcast. So in any given frame, you may have unicast and broadcast, let's say.

So putting broadcast and unicast in the context of this discussion helps highlight some of the benefits that multicast and broadcast have over unicast. The main advantage of multicast or broadcast is that the bandwidth that would normally be used to send information to just one device can be used to send that information to multiple devices.

So as you can see on the right-hand side, if a number of people are to receive the same content using unicast, at least one subframe must be used to send the content for each UE that wishes to receive the content. So five UEs, five subframes;

10,000 UEs, 10,000 subframes; whereas on the left-hand side, broadcast or multicast is used, just one subframe can be used to send the content to everyone, regardless of the number of UEs that you have. And just to be clear, Your Honor, this red box is meant to indicate that that subframe is reserved for broadcast; it's not part of the gold that UE number 3 or UE number 2 is listening for.

And so this slide just shows one image and a couple of UEs. But given that you can have thousands of UEs in a cell, and that, you know, a three-hour Super Bowl broadcast is made up of hundreds of thousands of images, you can imagine how doing this in a unicast mode would really put a load on the network.

So broadcast and multicast were available in the legacy networks, but they required the network operators to dedicate portions of the radio spectrum or network resources solely for broadcast, which meant that if there was nothing to broadcast, no Super Bowl and no Olympics that day, those resources went unused. And so that was not a particularly attractive scenario, because if you're not using those resources, you can't use them for unicast.

So therefore there was a desire in LTE to have a system whereby broadcast and multicast could be dynamically scheduled. And by "dynamically scheduled," I mean what's showing here on this slide. If, you know, if there's nothing to broadcast,

everything can be used for unicast. When one or more services have something to broadcast, you can grab up some of those subframes or resources and schedule the broadcast, and then you can release those resources when the broadcast has concluded.

There are some problems, though, that crop up with dynamic scheduling. Because the resources aren't permanently assigned, the UE doesn't know in advance when and where it should be finding the broadcast. And so without knowing that, it doesn't know that, it has to listen to every frame and subframe and process them as they come in to see if, you know, the Super Bowl is there. And, obviously, that will deplete the battery if your phone is constantly having to process everything over the course of the broadcast.

Another problem is if the UE doesn't know where to find the service, it not only has to read through all these frames and subframes, but the base station will still need to have some sort of indicator in a frame or subframe to indicate that, *hey, this is part of the Super Bowl, you should listen for it*. The UE doesn't know that in advance to find the Super Bowl in frame X, the UE will -- the base station will have to insert some sort of identifier in each of those subframes. And, you know, as I said before, given that there are -- these subframes are one millisecond slices of time, that would mean adding additional overhead information, you know, that is being sent a thousand times every second.

So we get -- when we get to the invention of the '613 patent, which is, I think, a pretty clever solution, the UE merely needs to receive a small amount of what the patent refers to as position information. And that position informational allows the UE to identify a pattern of frames in which the service will be sent. So here, the pattern is every other frame. This means that the UE will not need to constantly process frames looking for the service it's interested in, and that the base station will not have to constantly send information identifying where to find the service.

Again, think about the example of the Super Bowl. The UE just needs to receive this position information, you know, when the Super Bowl starts, and then the -- you know, until it's told otherwise, it knows it can find the service in those frames. So you go from a scenario where you would be crowding the network with signaling every millisecond to one where you can just send a tiny piece of information at the beginning of your broadcast and don't need to send anything else until something changes.

The benefits of being able to dynamically broadcast services have been widely recognized, especially as people consume more and more video on their phones. I don't know if you do, Your Honor, but I find myself occasionally stuck in the airport watching a fair number of movies.

And finally, just to tie this into claim construction to foreshadow next week, it's the meaning of the term "service" that's in dispute. Huawei doesn't think that the term needs to be construed, and Samsung has proposed that the "service" should be interpreted as the value of a service. But we'll get to that next week.

I'm happy to answer any questions about the '613, or I can move on to the '166.

THE COURT: That was very helpful, Mr. McBride. Thank you.

MR. MCBRIDE: Thank you.

So the '166 patent, here we're talking about the concept that Mr. Bettinger referred to, UE mobility, where a phone or a wireless device moves from one cell to another. And in particular the '166 patent refers -- is concerned with the transition of a mobile device from an LTE network to a legacy network.

Now, there's, you know, 4G, 3G, 2G. Generally when we talk about legacy networks, I'm talking about 2G and 3G. But even that gets complicated, so for the purposes of presentation today, I'm just going to talk about 3G, and that will be my standing for legacy networks.

So the improvements in 4G networks created some compatibility issues with legacy networks. The LTE networks have a different architecture, they have different identifiers,

and they use some different messages than the 3G or legacy networks did. However, for efficiency purposes, it's often advantageous if the 3G network can obtain information from the 4G network about the phone and various other things that were happening in the 4G network before the phone transitioned or moved to the 3G network.

In particular there's one piece of information that the legacy network would like to obtain from that LTE network after the phone moves, and that is the context or the so-called context of the UE or the UE context. The UE context contains important information about the UE, such as an identifier for the UE, billing information for the subscribers so they know whether your call should go through or you should be allowed to receive data, and a whole bunch of various capabilities that are too complicated for me to understand, and so I'm not going to go into them.

But in both 3G and 4G there are specific entities on the network that are responsible for managing and keeping track of this UE context. I've done my best to come up with an abstract representation of it which I've, you know, pictured with a Rolodex - each little card on that Rolodex being a context, a context that one of these entities is keeping track of. And it's advantageous if we could just swap cards for context rather than having to copy it all over or create the card from scratch.

And I'm going to address what these entities are that's shown on this slide, the SGSN, or Serving GPRS Support Node, and the MME, the Mobility Management Entity, on the next slide when we show a picture of the network.

And so this is just generally a simplified high-level overview of 3G and 4G networks, Your Honor. Unlike I think most of the other patents you're going to hear about today, to understand the '166 patent we need to get into not just the wireless communication between the UE and the base station, but also the wired back end of communication that connects everything up to the Internet.

So as Mr. Bettinger, I think, mentioned at a high level you can divide both the 3G and 4G networks up into two parts. So pictured in the box on the left-hand side of the screen you have the Radio Access Network, or RAN, and that's really in charge of handling all the wireless communications. On the right-hand side you have the Core Network, which is responsible for handling the back end wired communications that ultimately result in the information your phone wants to receive or sending going out to the Internet.

And I do apologize in advance, because we have to wade pretty deeply into the alphabet soup that Mr. Bettinger was referring to. We do have that glossary, but if it at all becomes confusing, let me know, and I'll try to clarify as we march through some of these acronyms and abbreviations.

So as I said, this slide shows a simplified overview of the network architecture in both of these networks. For purposes of this patent, there are a couple of network entities that are particularly important. As you'll see highlighted in the top in green there is a NodeB and a Radio Network Controller, RNC. These entities were combined together in LTE as an eNodeB shown in green at the bottom. They are in the RAN portion of the network, and are therefore sometimes referred to as "RAN Nodes." But they're generally responsible for wireless communications with the UE and passing information back to the Core Network.

And really the entities that are most important in the Core Network are those two highlighted in orange, that SGSN, and the MME for LTE. They're the entities that are responsible for handling UE mobility, and an important part they are the ones that keep track of the UEs' context.

Each MME and SGSN are assigned a numeric identifier in their respective systems. In 3G, the SGSN is assigned a Network Resource Identifier, or NRI, just a number between zero and ten bits in length.

In 4G, there's an MMEC, or MME Code, again, a number that's used to identify the MME in the system. These identifiers can be used to look up the actual network or IP address of its respective servers to allow other devices or entities on the network to communicate with them.

There's one other important identifier that we need to discuss, and that is the International Mobile Subscriber Identity, or IMSI. That is a number that uniquely identifies a cellular subscriber. There's a picture here. It's a lot like a social security number. And it's just as sensitive as a social security number, because if a hacker gets a hold of your IMSI, they can make potentially unauthorized charges to your account, or unauthorized use of your account.

A while ago there was a big scurry about cloning cell phones, and I think that's dropped out of the popular press, but that involved stealing the IMSI.

Now, because it's so sensitive, 3G and LTE were designed to avoid transmitting this identifier over the air whenever possible, and so instead the systems use temporary identifiers when the UE connects to the network.

There are two temporary identifiers that are important for the '166 patent. The Packet Temporary Mobile Subscriber Identifier, that's a 3G concept, and the Globally Unique Temporary Identifier, which I'm assured is pronounced "GUTI." These are each allocated by the -- with respect to SGSN or the MME when the UE connects to the network.

Just a brief aside. When the '166 patent was drafted, the standards body had not yet finalized the name of the temporary identifier in LTE, and so in the patent there's reference to an SAE TMSI. SAE stands for System Architecture Evolved. It's

sort of a common term that's used in LTE for what's coming next. And Mr. Guo, who is the inventor of the '166 patent, is also the one who proposed that GUTI and its structure to 3GPP, which is how I know it's called "GUTI."

So just diving very quickly into -- a little bit deeper into the structure of the P-TMSI and the GUTI, here we're looking at the P-TMSI. Some of this information is just being given for reference, so you have a full picture. But really what we care about is that NRI portion shown with the blue, I'll call it, at the top, and the UE identifier.

The next slide, the GUTI, as you can see, is significantly more complicated, but, again, we're just going to focus on a couple pieces. Really what's important for us is this MME Code, the identifier for the MME, and the M-TMSI, which is just another name for the Identifier, the Temporary Identifier that is used for the UE in a 4G system.

So now we get to the fun part where we get to put all these pieces into play. In this slide we're looking at the legacy network, the 3G network, and all the processes that occur when the UE moves from an area that is served by one RNC, one of those RAN Nodes, to another.

When the UE moves to a new area, it will send a type of access message that is called a "Radio Resource Control," or "RRC" message, to the new RNC that is now serving. So as you can see as the phone moves, it was being served by RNC-1, now

it's being served by RNC-2. It passes an RRC message to the RNC number 2, and if the RNC-2 is not served by that old SGSN that has the context, the RNC number 2 will ask the SGSN that it is connected to to use an identifier found in that RRC message to look up the address of the old SGSN in a domain name server, or DNS, and in that way the new SGSN can contact the old SGSN and obtain that UE context.

Similarly, when the UE moves from an LTE 4G network to the legacy network, the UE really only has available this same legacy message to establish a connection with the legacy network.

An RRC message, this is this legacy message that's being sent, has two portions. One is -- one portion is an access stratum, and that is a portion of the message that's intended for that RNC, or RAN Node; and then there's a non-access stratum, or NAS portion of the message, which is intended for the Core Network.

There is an NRI field in the RRC message that is used to identify the network entity that has the UE context. As we previously talked about, that NRI may be included in a P-TMSI, and there is a P-TMSI in the RRC message.

But the problem, of course, is that the UE that's moving from the LTE network to the 3G network doesn't have the P-TMSI, all it has is the GUTI, and that is not something which the legacy network recognizes.

So we end up with this problem: How can the legacy network get the context from the LTE network if the legacy network doesn't understand the identifier that was used by the LTE system, and if the legacy messages don't contain the fields designed to carry the LTE identifiers.

And what the inventor of the '166 patent realized was that the UE could break apart the GUTI and extract information from it, the MME Code, and construct a legacy message with repurposed portions.

These next few slides will walk through exactly how that works. I think it's easier to sort of see it animated than for me to just throw the alphabet soup at you.

So as I said, at first the UE extracts the MMEC or the MME Identifier from the GUTI, and then it will create that RRC message and place the MME Code inside the P-TMSI. This was actually, I think, a really clever point of the invention, because if you think about these identifiers, they're only ever given out by network entities to the UEs. It's not something that the UE creates itself. It would be like you changing your driver's license number on the fly, or changing your social security number. It's just not something that's really done.

So then the UE will shoot that RRC message off to the RNC, or the RAN Node. The RAN Node will take that NAS portion of the message and shoot it off to the SGSN, and the SGSN uses the identifier and the P-TMSI to contact the DNS, which sends back

the IP address of the MME, and then the SGSN will send its message to the MME. Now, the MME can speak both 3G and 4G, because it is, you know, the new system, so it can respond with a message that the SGSN understands, and the context can be transferred from the MME back to the SGSN, and that's the long and the short of it.

Just to -- and then, again, a little preview of claim construction. The dispute here relates to claim language, a first P-TMSI in an access message. I think it's Samsung's position that that first P-TMSI must be in a particular portion of the message, and Huawei thinks it can be anywhere.

And if there are no other questions, Your Honor, that concludes my presentation on those patents.

THE COURT: Great. Thank you.

MR. MCBRIDE: Thank you.

MS. YANG: Good morning, Your Honor. Irene Yang for Huawei.

You'll be pleased to know that there are many fewer acronyms in this patent than in the last one, so hopefully that makes it a little bit easier to follow.

So I'm going to talk about the '197, the '246 and the '003 patents. These are all related, so we'll just talk about them in a group, and in general I'll talk about them as the '197 patent family.

So these patents deal with an aspect of LTE that's

actually related to UE mobility, which Mr. McBride just discussed, and specifically they deal with cell selection.

So when a UE is connected to a network, it's actually constantly still seeking the best available cell, because it wants to give users the best quality signal and experience. So there's a few common scenarios where a UE might need to find a better cell. First, the one shown on the top is if the UE physically moves locations and it needs to select to a different cell. So, for example, if I'm holding my phone and I move physically to a different area, my cell phone, my UE needs to select a new cell. And so this is more like the UE mobility situation that we were talking about before.

And second is the UE might detect that the quality of service from the cell that it's been using has degraded;

Or third, a UE might need to find a better cell, if some cells in the system are heavily loaded and others are lightly loaded, because the system wants to reduce cell congestion generally, so that if the system needs to balance the load on its cells, the UE may need to select another cell.

There are different possibilities for the cell that the UE can select. So one possibility is, for example, if the UE is in an LTE system, it can pick another cell in that same LTE system using the same frequency band that it was on before.

And just as a note, because we've talked about frequency already this morning, here we're using frequency in a slightly

different way. We're talking about different cells using different frequency bands, so different portions of the spectrum that have been allocated to different carriers.

And the second possibility is to select other cells in the same system, for example, LTE if you're already in LTE, but using a different frequency band; and then the third is to go to a different system entirely, such as going from LTE or UMTS -- excuse me -- from LTE to UMTS, or 3G.

So in general up until now we've been depicting cells as if they're separate geographically. But as Mr. Bettinger mentioned, cells can be overlapping, and that's what we're trying to depict here, showing that a -- you know, different LTE cells might be overlapping, and they might overlap with a non-LTE cell.

So in LTE, a UE that is in the LTE system will take measurements of its neighboring cells, according to a list of priorities that are established by the LTE base station, which governs which cells the UE can try to select, and so it's taking these measurements, because it's trying to check the quality of the cells around it, so, for example, the signal strength. And so if the cell that it measures that has the highest priority meets that quality criteria, then the UE will select that cell.

So LTE uses this concept of priorities, because it reduces the number of measurements that need to be taken. So without

the concept of priorities, a UE will take the measurements of all of the cells that are nearby, all of its neighboring cells. But the concept of priorities helps the UE save battery power and operate more efficiently, because it only has to check the cells that are indicated by the priorities.

And so the options that are set forth in that list of priorities are each given a number that indicates their priority from 0 to 7, where 7 is the highest priority, and that's where the UE will start when it starts seeking to select a cell from where it is.

There's two different types of priorities that can be given to a UE. The first on the left is public priorities, and this is where the base station would give every UE the same list of priorities to follow, and so that's depicted here on the left where each of those UEs that is part of that cell is getting that same list of priorities; and the second is dedicated priorities, which is shown on the right where the base station gives each individual UE its own list of priorities to follow, and we've depicted that, because it's a little hard to see, showing that one of them is green, and one of them is blue, so they're not the same.

The concept of priorities for use in cell selection was introduced in LTE, but it was advantageous to incorporate the concept into 2G and 3G so that you would have increased compatibility between LTE and 2G and 3G. And since the UE in

an LTE system could be given priorities that include 2G or 3G systems, the question is how to incorporate 2G and 3G into this general concept of priorities.

And so to solve that issue, one idea or one option was to use dedicated priorities established by the 2G or the 3G cell. And so, as depicted here, for example, then it would require the non-LTE or the 2G or 3G cell to send the UEs their own dedicated priorities.

But this had some issues. Because each cell then has its own priorities, you're not coordinating among 2G, 3G and LTE. Carriers would have to go and upgrade all of their non-LTE system equipment, because priorities came in LTE, and so their non-LTE systems that existed didn't have that understanding or that capability, and that's time-consuming and expensive for the carriers.

And then third, it increases the control signaling overhead in the carrier systems, because now non-LTE systems were also sending around dedicated priorities to all of the UEs.

So the solution of the '197 family of patents is that after the UE obtains dedicated priorities from the LTE system, if it then selects a non-LTE cell, then even while it is in that non-LTE system, 2G or 3G, the UE will continue to use the dedicated priorities that it received from the LTE system when it is looking for better cells while in non-LTE.

So as you see here, it gets the dedicated priorities from the LTE system, and then when the UE has selected to a non-LTE cell, it just carries those with it, and it continues to use that. And the benefit of this solution is it reduces the need to upgrade your non-LTE networks, because they don't have to now be able to provide their own dedicated priorities. They're just using what they've carried from the LTE system; and it reduces the amount of signaling, because now only LTE is sending out these priorities, and it allows for more coordination among 2G, 3G and 4G.

And just to wrap up, as a preview again for next week, the issue to be discussed is the meaning of the term "dedicated priority list." And so Huawei's position is no construction is necessary, but in the alternative a correct construction is just a priority list for the specific terminal.

And Samsung's position is that the "dedicated priority list" is a dedicated list that includes different radio access technologies listed in order of priority.

So the question is whether the "dedicated priority list" must include different radio access technologies, and whether they must be listed in priority order. But we will discuss that next week.

THE COURT: So you listed public priorities in addition to dedicated priorities.

MS. YANG: Yes.

THE COURT: And why does a base station choose one or the other? Or have public priorities now gone the way of all flesh, and we only deal with dedicated priorities?

MS. YANG: No. So there are still public priorities, and a number of the claims in the patents do address the situation where they basically say -- and this is not all of the claims, so, you know, I'm not trying to characterize what all of the claims say, but they go to the idea that you would have a dedicated priority list that you take -- that the UE takes from LTE to non-LTE and uses it in the non-LTE system. But there's actually also this concept of expiration of a valid time of that dedicated priority list; and then there are claims that discuss that when that valid time expires, then the UE will revert to using a public priority list. So it still exists.

THE COURT: All right. Is that a concept that I need to understand for claim construction?

MS. YANG: No, I think "dedicated priority list" will do it.

THE COURT: Great. Thank you.

MS. YANG: Thank you.

MR. LEWIS: Good morning. Doug Lewis, and I'm going to cover the next two patents, the '278 and the '239, starting with '278.

So to put the '278 patent into context, this patent

involves both uplink and downlink, but using them for different things. We, on the '278 patent, are getting control signals on the downlink from the base station and using that data to provide user data, the useful stuff we all care about, Facebook pages, web pages, requests to the base station. And that's the context.

First thing -- again, this is more concepts -- general things I think you need to know to understand the patent. The downlink control signaling involves sending control data from the base station to the user equipment, to the UE, the mobile device. And in the case of the '278 patent, the specific user specifically used by the UE to format its uplinked data requests, what data it's sending to the base station.

In particular there are two parameters that are at issue from the downlink control signaling. The first is the payload size. And the payload size represents the size of the payload portion of the uplink data. So in other words, the base station is saying to the UE *when you send me data, size it in this way*. *This is what I'll expect from you*. And that's part of setting up a new transmission from the UE to the base station.

The other term and concept is "redundancy version," and this is something that's also sent from the base station to the UE, and it's used for retransmission. And when the data is not properly received, the base station will send, as part of the

control data back to the UE, a redundancy version, and then the UE will send the data again up to the base station. And we'll cover that in a little more detail in a minute.

So what is the invention and why are we all here? The goal is to reduce the number of bits used in the downlink control signal. The more bits you use for something, the less bits are available for other things. These systems are always trying to push both capacity and speed. And so this patent actually will save bandwidth and the downlink by combining the two parameters we just talked about, payload size and the redundancy version, into one parameter that will be smaller than the two original parameters were in the prior art.

For a moment let's talk about sort of the background here.

This is how the control signaling is used. The user equipment first says to the base station it needs to send some data. So user data A could be a request for a web page or a Facebook posting or something. The base station then says, well, here's -- there's a lot of other things going on, of course, as well -- but the base station says, you know, you need to size the payload portion in this particular way, and the payload size is then sent to the user equipment. The user equipment already knows to use a default RV at that point. It's a default. It means it already knows it when it gets the payload size. At that point the UE will send the user data up to the base station, in our example here on this slide that

works great, and the base station sends back to the UE *got it, we're done,* move on to the next piece of data.

Unfortunately, in wireless communications things don't always work quite that well, so we have to have a provision for when things don't work well. In this case it starts out the same, the request to send some user data. Payload size is again sent. The user data is sent from the mobile up to the base station, but for whatever reason it's corrupted or it doesn't get there, or something happens. The base station then sends back to the UE and says *you're going to have to resend that*, and *here's your redundancy version*, which gets specifically sent back from the base station to the UE in that case. The UE then resends the data, in this case user data B, to the base station.

Now, the user equipment, the UE, knows to use the same payload size, because it's resending the same thing. So you don't need to resend the payload size, you already have it from the initial transmission. So you use that same payload size in response to the RV, and send the data back up to the base station, and in this case it works, and we're done with this.

So this leads to the invention.

In the prior art, we had a field that had a bunch of other stuff in it, but in particular for our purposes we had a payload size, and we had a redundancy version. And the payload size can vary in size, but let's assume it has six bits and two

bits for the RV, a total of eight bits. Using the invention, you have one field of six bits only, and you can still pass the data on to the user equipment from the base station using only six bits. You save two bits, which frankly doesn't sound like a lot, 2, 1s and 0s, but this is something that happens constantly as data is being sent back and forth. Obviously, there are many, many UEs, and we're not even talking the same base station or the same cell, this multiplies out.

So the invention is to realize that the state or the value of that one field can tell you if you're talking about a redundancy version or if you're talking about a payload size. So you don't have to send them separately. The value of that field can tell you whether it's one or the other, as the patent explains here.

The patent also gives a particular example, which I've blown out in this slide with the table at the bottom. The specification talks about using a six-bit field - 6 bits to the 6 is 64, so there would be 64 possible values or states from six bits. The patent explains that the first four bits, values given there in binary, and the table at the bottom I converted them in parenthesis to the more familiar decimal. So the value 0, 1, 2 and 3 would be redundancy versions, and then the values on from there are 4 through 63 would be payload size, different, you know, examples of payload size would be given that way.

You're providing -- then it's practical as the specification goes on, to figure out whether or not you're receiving a redundancy version or a payload size from just the value. You know, if you have a 2, it must be a redundancy version. If you have an 8, it must be a payload size. And so you're able to save those two bits, but still provide the data you need to provide to the UE for that to function.

Now, in addition, the patent talks about having a default value for the redundancy version, or the RV, so when you're sending payload size, the system knows that the RV is a default value. It doesn't need to be sent, because the system just knows it. That's what "default" essentially means. And that's part of the dispute, or, actually, basically the dispute between the parties that we'll talk about next week, about the default value, and how that fits into this term.

Your Honor, if you have any questions on '278, I was planning on moving on.

THE COURT: Go ahead.

MR. LEWIS: All right. '239. This patent is in a slightly different context. This involves interference, or more accurately reducing interference for the uplink, and it allows more efficient transmissions. The less resending we do, the more the base station understands what the UE is sending, the faster and more efficient the network can be.

So what kind of interference are we talking about? In

this case it's inter-cell interference. Cells overlap, radio waves travel where radio waves want to travel. If you're near the edge of a cell, like the UE with the red around it in this figure, those radio waves are going to travel as intended to the base station for cell B, but quite possibly they're also going to travel to the base station for the bottom of cell C. That's going to cause interference, because the base station for cell C isn't expecting those radio waves. That UE is not even in that cell. So you have to have a system to deal with the interference, and the goal with the '239 patent is to reduce that interference.

And conversely, when cells are farther away, just less of an issue. You can use -- those aren't going to interfere, because they're farther away.

So let's talk about what is the invention. The invention is to reduce the interference at the base station caused by UEs in other cells. This is not a patent about reducing interference between cells in the same base station. That's a different category of problem. This is between cells in the two different -- sorry -- UEs in different cells, and it relates to allocating sequences, which we'll talk about in a minute, to different cells to reduce that interference.

I'd like to introduce a few concepts relating to really the kind of interference in particular that we're trying to reduce. The interference of the '239 patent is discussed and

is interference when the UE sends a reference signal. And a reference signal is kind of like the light from a lighthouse. It's this sort of signal that's sent out, and it's known to the UE. It's a constantly -- not a constant, but the signal is known to both the base station and the UE. And by receiving that signal and knowing what it's supposed to be, the UE -- that the UE is sent -- the base station can then interpret the other data. So if the known signal is distorted in a certain way, it can undistort the data, the useful data, control data or user data, and understand it better. So reference signals are important, and, if they're interfered with, that process can't occur.

And to do this where there's sequences are a little more complicated than the one I have there, and we'll talk about those in a minute.

Another concept is correlation, and correlation refers to similarity. And so what we're ultimately going to talk about is correlation between reference signals, but let's talk about -- talking about how correlation relates to other things.

So low correlation means not similar. Those would have low interference. And, you know, we struggled to try to find a way to represent this metaphorically, and we finally came up with colors. So the colors there at the top are different. They don't interfere. Easy for I to pull them apart and to see which one is which.

A high correlation, or similar signals, are those that would interfere, and the colors are sort of gray there at the bottom and all kind of look alike. And sure we can pull them apart with our eyes, but it's difficult. Those would be high correlation interference signals.

So the goal of the '239 patent is to give low correlation signals to nearby base stations, and then let the base stations better able then to distinguish the reference signals.

One more -- another couple concepts.

The sequences, as I mentioned, are much more complicated in the 0 through 9 that I had before. This patent talks about things called "ZC sequences." There's other sequences in the patent, too, but I'm going to focus on ZC sequences for the moment.

ZC sequences are mathematical concepts invented in the 1970's by Mr. Zadoff and Chu, hence the "ZC." These are complex numbers, real and imaginary components, that I am not going to explain in any more detail than that. But certain ZC sequences have lower correlation, are less similar with other ZC sequences; some are more similar. So the goal of the patent, and what you want to do, is you want to figure out the similar and the non-similar signals and use them appropriately to reduce interference in the reference signal.

One more concept. This is actually straight from the claim. The claim uses these brackets (indicating). Everybody,

when they first look at them, thinks they're square brackets, but they're not. There's no top on one, and no bottom on the other. They're really simple: Floor function always round down, ceiling always round up. I think there's a footnote in our brief that explains this, too. But they look like square brackets. I just wanted to mention that they're not.

Okay. Back to the invention.

Reducing interference between cells. So what you want to do is you want to take interfering ZC sequences and use them in farther apart cells, if you need to, and use low interference ZC sequences for cells near each other. Therefore, like the colors, the cell can distinguish signals sent from the one in the middle there, the cell phone in the middle, from the ones that are supposed to be in its cell at the bottom.

And so the patent talks about grouping sequences. This is how we figure out which sequences have low correlation and which have high. So you want to group sequences such that each group has sequences with a high correlation, in other words, they're very similar. Put those in a group. By definition then, the correlation will be low between groups. And I did this with the color just illustrated. If you put all the grays together, all the greens together, and all the purples together, while it's hard to distinguish the particular circles within each group, the groups are all distinct.

And then if you assign -- going on to the next slide -- if

you assign different groups to different cells to different base stations running those cells, you're able to use sequences that don't interfere.

And so the invention involves defining which sequences to include in which group, which results in groups that have highly correlated or similar sequences within the group, but dissimilar without. So by assigning different groups to different cells, you've solved your correlation problem and reduced interference. And then the way this is actually done in practice, and how these things are calculated is a subject of the claims.

And Your Honor, with that, we have concluded Huawei's presentation.

THE COURT: Great.

MR. LEWIS: And then I will give the floor to my colleagues on other side.

THE COURT: Thank you, Mr. Lewis.

MR. VERHOEVEN: Good morning, Your Honor. Charles Verhoeven on behalf of Samsung.

We also have some slides I'd like to hand up. And I'll be addressing the same patents that were addressed, and my colleague, Ms. Acharya, will address the '613, but I'll be addressing the other, Your Honor.

I'd like to start with '278 patent, Your Honor. This is the one that talks about combining the RV and the payload.

So just to start out, we're dealing with control signaling in the data packet; and typically nowadays those are separated out, so you have control signal, which is a little bit of data, then you have the huge data packet that comes down from the base station.

When you -- when the data packet comes down, it has a certain payload per packet, and that's what we're illustrating here in the green box. And then what the control tower -- base station will do is it will send a control signal that indicates what size that packet will be, so that the UE, the cell phone knows that before it gets the packet, and it helps it process the packet.

So there's certain concepts that I'd like to cover briefly that are kind of background to this patent. One is this HARQ process, Hybrid Automatic Repeat Request, so you might see that, Your Honor; and what that is talking about is when you have interference between the base station and the cell phone. And we illustrate here there's a packet with blue and red and a line in it indicating data, and then there's interference, and then by the time the UE gets it, it's corrupted, and it has errors.

So what happens in a HARQ process is the cell phone will then send a NACK, which indicates to the bay station that we're not acknowledging that this is -- that we received the whole packet, there's a problem, resend. And then the base station

will resend again the packet, and it might have some different errors. But the -- what will happen is that the UE will match the previous packet to the -- to the prior or to the incoming packet, and it will repeat that until it feels -- it determines it has the whole packet, and then it will send an ACK. So that's the HARQ process.

Now, another concept relevant to this patent is what's called a "redundancy version," and this is used in connection with the HARQ process to help it. And so here, what happens is the base station will send data that has different redundancy versions, so there are different versions in the encoded data. And so here is redundancy version zero, gets a NACK, the interference corrupted it, sends a redundancy version one, there's interference, gets a NACK, then it says redundancy version two. And by comparing those three versions with an algorithm, it can then determine what the packet is and sends an acknowledgment. So the redundancy version information is sent in the control channel. And that's all I'm indicating on this slide here.

So just like it tells you the packet size of the control channel, the control channel also tells the user device what redundancy version it's sending, so that the user device knows when it gets the packets that, hey, this is redundancy version zero. And then as I said, the receiver then recreates the original data using an algorithm.

Third concept. This is control signaling using what's called a "common field." A long time ago the control signal would have a separate field for the payload size and a separate field for the redundancy version. More recently what's happened is the payload size and the redundancy version are combined into what's called a "common field." And so this patent concerns specifically this common field and certain attributes of this common field. It's a very particular patent.

The prior art -- I guess I have a little bit different view than counsel who said the prior art is eight bits. Actually, the prior art -- there's prior art that's six bits just as claimed in the patent.

This is an example, Your Honor, from a Samsung patent. This patent was filed in December 2002, four years before the '278 priority date. And here you see the common field, we've highlighted it there, and under N, the TBSS in the top; do you see that, Your Honor? That is referring to the transmit block size. So this field is used in N to transmit to the UE what the payload size is. Then the same six-bit field is then used to trans -- but it only uses two of the six bits, and those two of the six bits, without using the others, indicates to the UE that it's sending a redundancy version. So it has the same field. It sends -- it uses all six when it's sending a payload, and it uses only two when it's sending a redundancy

version. This patent is very particular about this stuff.

Now, turning to the patent. It says:

(reading) For ease of identification, in a six-bit field, four states whose foremost upper limits (sic) are all zeros can indicate four different RVs. That is, the four states, 0, 1, 10, 11, and that's illustrated down below.

So that, if that -- in the patent, those four states would indicate that it's an RV.

Then it says: "Accordingly, the remaining 60 states" -- which we've illustrated in I guess pink down at the bottom with an ellipsis.

(Reading) Accordingly, the remaining 60 states, any bit in the four foremost upper bits of the remaining 60 states is non-zero. That indicates that it's a payload size.

So what it's basically saying is, on this next slide, this is slide 13, it's referring to what I highlighted in blue. If any of those bits -- the '278 patent says if any of those bits are non-zero, that means it's a payload size. And if -- but if they're all zero, that means it's a redundancy version, and that's how the system knows whether this common field is indicating a payload size or a redundancy version.

And in the detailed specification, you can see it describes this about indicating it's one or the other - it's a

payload size or a redundancy version. And I'm not going to read those in the interest of time.

And then notably in the prosecution history, this *Kim* patent came up. And this same picture you looked at from Figure 10, this is in the prosecution history, and the patentee distinguished the '278 by saying:

(Reading) The '278 Claim One requires that both payload size and RV are indicated through states of a field where the states is indicated by all N bits of the field. And in contrast, *Kim* uses only some bits, but not all bits of the common field.

So the point of distinction in this patent is simply the '278 says it always uses all fields, and the prior art uses -- for redundancy version only uses two of the six fields.

So that's basically the '278 patent, Your Honor.

Now, if I could move to the '239 patent. This is -- this one is math, so it's a little hard for me at least, but this is the patent that allocates sequences to avoid interference between cells, have a low correlation. And so for background, the -- here we start with the base station sending to the UE something called a "known reference symbol," so that's a new concept. And, again, this is all about avoiding interference. And it also -- this is the payload coming over, so there's a known reference symbol, and the unknown data is the payload. So the reference symbol is something that both the base station

and the UE know. They both know what the known reference symbol is supposed to be.

So then what happens is you get interference, and the UE receives corrupted data for both the known reference symbol and the unknown data, and then it sends back to the base station the known reference symbol and the unknown data, and the same thing happens. There's corruption.

So before I get into the more specifics of the patent, just to close the loop on this. The known symbol is used to help figure out what the interference is doing to the symbol -- or to the data, and it's used to correct errors in the data that's transmitted.

So that's all background, and then we get specifically into the area where the patent is talking about. And this -- the patent is talking about something to do with these known symbols, Your Honor. That's why I go into those.

The patent describes a way to improve the performance of these reference symbols by assigning different subgroups of symbols or sequence to different cells. So here you have group K which is a group of cells, and then within it you have subgroups. So you have cell one, cell two, and cell three, so you have these three different subgroups in my example.

And then what the patent is trying to do is assign sequences for these known symbols that have a low correlation between -- when -- between the cells that are touching each

other. And so they want to avoid -- it helps avoid interference when you're moving from say subgroup 1 to subgroup 2 or subgroup 3. And there's certain mathematical properties that they can use in these sequences that give them a low correlation which translates into less likely that they'll be confused.

So here is an example of sequences. I just want to point out that the sequence group can be different sizes. So here I've shown one is 10, two is 9 and three is 8 bits.

Now, getting to the -- one more thing before we get to the specifics of the patent. There's something that it's hard to understand, but it's called a "basic sequence." And the way the basic sequence works with cyclic shifts is you start with a number, and then the cyclic shift -- in this example you shift left one bit, and this is something that's part of this whole thing. So you have cyclic shifts based on a basic sequence.

Now we get to the claim at issue. I have to use the claim, because this equation -- there's a specific equation in this claim, Your Honor, and it is -- that specific equation is not in the spec, so I have to use the claim to explain it.

So here you see the sequence of each length need be planned separately, and the interference among sequences with different lengths needs to be considered in a system with multiple cells. So that's what I've illustrated or highlighted with the red underline. If you look at the claim it says N_I is

a length of a sequence in the candidate sequence collection. N_1 is a length of a reference subgroup sequence. So that's where the claim talks about different sequences, lengths that you need to keep track of and plan for separately.

Then the claim also talks about a basic sequence index. And the sequence in each subgroup are generated by this -- by a particular basic sequence. So that's what we just looked at, the basic sequence, and then you have the cyclic shift after that, and that's what the basic sequence index is referring to there. It's a very particular basic index sequence that's being defined in the claim, and that's what you're looking for in this claim.

Then you'll also note that there's -- the claimant in this equation in the claim uses a group number k. That is a reference, Your Honor, if you think back to the illustration of the big circle group K, and then from that number K, which is a constant in this equation, you determine subgroups, basic sequence index, et cetera, et cetera.

So how does this work? Well, it's just math, Your Honor. And so I've just provided one example.

Now, some of these variables, I_K, N_I and N_1, or I should say some of these indications are variables, and some of them are constants. So, for example, K is a constant in this equation, whereas I and the others ones can be variable, I believe.

So here on the left-hand side, Your Honor, we've tried to put -- well, if you look at the claim, it says:

(Reading) A value of a basic sequence RI in the subgroup I in the sequence group K is at least one of, and it has four things.

So then if you look down at the bottom left, that's basically a restatement of what they said, because the claim is pretty -- not worded very clearly. But there's four different things RI could be, basic sequence could be.

And so this is just an example, but say you have I is 1 and K is 5, N_I is 10 and N_1 is 6, the claim would then, if you follow the claim, then you'd get a reference sequence of 8.3, 8.3, 9.3 and 7.3. So that's what the claim is basically -- that's how you walk through the claim, the equation in the claim.

And then there's also this concept of rounding down and rounding up. I think counsel already covered that, so I will -- I don't think I need to talk about that.

Now, Ms. Acharya, will address the '613, Your Honor.

THE COURT: Great.

MS. ACHARYA: Good morning, Your Honor.

THE COURT: Good morning.

MS. ACHARYA: Deepa Acharya for Samsung.

So I'm going to be talking about the '613 patent. Just so you know, there isn't as much math involved in this one, so it

might be a little bit easier to understand. A little bit of math, but not too much.

So this was the first patent that Huawei's counsel talked about this morning. Basically, this patent has to do with a device and a method for sending a specific type of information, and that information is called a "service," and it uses a known method of transmitting this information called "time division multiplexing." So the '613 patent calls this service "time division multiplexing," because you're sending a service using this method called "time division multiplexing."

Let me just talk about time division multiplexing for you.

So you heard a lot about transmitting information between the mobile phone and the base station today. Time division multiplexing is just one way of transmitting that information between the mobile phone and the base station. And basically what it allows the network to do is it allows, for example, the base station to send multiple independent signals all together in a common signal path. The base station can do this when it's sending it to the mobile phone, and the mobile phone can also do this when it's sending it to the base station.

So if you look at the example on this side, the base station is able to send signals 1 and 2 together over a common signal path to the mobile phone. Similarly, the mobile phone can send, for example, signals 3 and 4 over a common signal in the uplink to the base station. And this is basically to help

save network resources.

Time division multiplexing is a very well known concept. It's been used over the years, dating as early as the 1870s. It was used in telegraphy to route transmissions simultaneously over a single transmission line. It was also used in telecommunications standards in the 2G GSM standard in the early 1990S, and then again it was also used in the wireless standard in the early 2000s in the IEEE 802.6 standard.

I mentioned earlier that this patent is directed to transmitting a specific type of information using time division multiplexing. That type of information is called a "service." And as it shows in the patent, a service can be either a multimedia broadcast multicast service, which we also just referred to as "multicast service," or it can be a unicast service. The patent is directed at only transmitting this kind of specific information, which is a service, not sending any other type of potential service information, just this multimedia multicast service or a unicast, the service itself.

So I just mentioned there are these two types of services. There's the unicast service and a multicast service. What is a unicast service? Well, it's a point-to-point service, meaning the mobile device request for a specific type of information from the network, and the network in response to that request sends that information back to the UE; for example, a text message, point-to-point, from one UE to another UE in the

network.

Another type of unicast service is, for example, we have these apps like Netflix, Hulu. A user opens it up on their phone and chooses, you know, a show that they want to watch. They send a request to the network. The network collects that information and sends that data for that video back to the UE, point-to-point. It doesn't send that information to any other device at that time.

A multicast service, on the other hand, is a little different. What that does is the network is able to send the same information at the same time to a number of devices that have requested that information. So it's a type of broadcast. Counsel for Huawei talked about broadcasting TV. You can broadcast radio. So it's a very specific type of broadcasting, and it's sent to multiple devices, as opposed to just sending it to one device as in unicast.

Here, I've provided some examples. And I just want to make it clear, because Huawei's counsel talked a lot about broadcasting video. Well, not all video is multicast. Actually, a majority of the video that we stream today on our phones and on our devices is unicast. So if you think of streaming video on Netflix or Hulu or HBO or Showtime, that's all unicast, because a user requests for a video or show on their phone, and that information is sent only to that device in response to that request; for example, text messaging is the

same, and you can also do music, Pandora, Spotify, same thing.

Multicast services, however, is a very narrow portion of that video streaming; and, actually, in the U.S. it's never really caught on. Verizon is the only major network carrier in the U.S. that's deployed LTE multicast in its networks. And Verizon has two applications which we can see here. There's the Verizon Go90 and the Verizon Indycar series, and that's basically how multicast is used on the Verizon network. Verizon Go90 allows a user to watch TV, pro live sports, certain sports that allow it. Verizon Indycar lets the user watch, I guess, Indycar races on their phone.

The fact, that multicast services is just not widely used, I can give you an example; for example, the Apple iPhones, they don't even allow for multicast services to be used on their phones. It's just not capable of it, because it's really not used. Other phones just don't have the functionality for users to be able to take advantage of the multicast services. So just to give you an example, it's just not something that's very well known.

Again, transmitting multicast and unicast services was also very well known. This was done in the 2G systems, it was done again in the 3G system, and then incorporated in 4G.

Now, there's two ways of transmitting multicast services. You can send it in mixed carrier mode, which is like we talked about using time division multiplexing; you can send multicast

and unicast over a common signal; you can also send it separately on the multicast and unicast in separate signals, and that's known as "dedicated carrier mode." But the '613 patent is directed to mixed carrier mode.

Now, I'm not going to spend too much time on this, because Huawei's counsel talked about it, but there is a carrier -- and this is the format for transmitting information from the base station to the UE. There's a carrier, it's made out of radio frame, radio frames are made out of subframes. But let's see how mixed carrier mode looks like when it's transmitted from the UE -- I mean from the base station to the mobile device.

You can see there's a carrier. I have an example up here. And in this example, radio frame 2 contains the multicast information. Radio frame 6 contains the unicast information. So this carrier is transmitting both multicast and unicast in the same carrier. So that's what mixed carrier mode means in this patent.

Again, transmitting in mixed carrier mode is known. The '613 patent acknowledges this in the background as well.

Now, the inventors of the '613 patent thought that there was a problem, because they thought that if you're sending both multicast and unicast in the same carrier, the UE, the mobile device won't know what's being transmitted. So what it has to do is it has to actually go through and unpackage each radio frame in order to figure out what's in there. And that, you

know, wastes resources for the phone.

So what do they do? They decided to send position information to the mobile device. Position information is basically a map. What it does is it tells the mobile device where exactly the multicast information is located, so then the mobile device can just figure out, okay, I know what's in these frames.

The patent claims talk about two different ways of sending this position information, and the easiest way for me to talk about it is by using an example. So the first way of sending this position information is to send the specific radio frames in the carrier. What I have here on the left-hand side, that I've highlighted in yellow, the highlighted yellow radio frames are the frames that contain the multicast information.

So in this case, in the first scenario, the base station would just send four radio frames to -- or send the number 4 to indicate that there are four radio frames that contain multicast information.

In the second way of sending position information, the base station indicates to the UE the interval or the pattern of where that multicast information is. Here, it would send what's called this 2 to the little M. In this example, little M is just number 1, because 2 to the 1 is equal to 2. That means every second frame now contains the multicast information. So it's a map. It lets the mobile device know

where this information is located.

Now, I just want to quickly talk about and clear up something related to the Super Bowl. Huawei's counsel talked about the use of streaming the Super Bowl using multicast to stream Super Bowl. Well, you know, when this concept was first introduced into the LTE standards, yeah, carriers were excited about it initially. They started testing it, started to see how they could potentially use the benefits of multicast services. In 2014, Verizon tested it in hopes of being able to stream the 2014 Super Bowl. It never did, though. It didn't get beyond a test.

We fast forward three years later in 2016, 2017, we see that even Verizon, who is the only major network carrier that's deployed LTE multicast, even they're saying it's not a moneymaker. Basically other than Verizon, no one else has done this.

Unless you have any other questions --

THE COURT: I don't. Thank you.

MS. ACHARYA: -- I'll pass it.

MR. VERHOEVEN: Your Honor, I'll quickly address the last two patents. I'll start with the '166.

This patent concerns where you're moving from an LTE system to a legacy system.

If we could go to slide 47.

So here in the description for the field of the invention

section, it's referring -- the present invention relates to a method and apparatus for accessing legacy, e.g. preexisting technology, such as 2G/3G wireless networks through a temporary ID of an evolved network.

So you have this temporary ID, that you heard about before, and what it's talking about -- how you handle that temporary ID when you move from an LTE to a legacy system.

And then I think it's helpful to sort of frame ourselves, for me to point out that all of the asserted claims that you'll be considering, Your Honor, are claims from the UE side of this back and forth. So when you're looking at all of this, you should be looking at it for what does the UEs do, because that's what the asserted claims are. There are other claims that are from the systems side, but they're not asserted.

All right. So really quickly, here we have a slide illustrating the known technique from the legacy network. And just in terms of architecture, the legacy network is broken into what's called an "access network," which is on the left, and that includes a series of base stations or NodeBs. And then on the other side is the Core Network, and that includes a series of entities called "SGSNs." So you have SGSN1, SGSN2. SGSN stands for Serving GPRS Support Node.

The name is not important, just -- so we just say "SGSN." The SGSN acts as a gateway to external networks, which I've just shown by the cloud on the top right, like the Internet,

and it passes data between the mobile device and these external networks.

So here we see an illustration. So the UE sends a signal to the NodeB, and the NodeB sends the signal to SGN1, and then what happens is SGN1 sends back an NRI. "NRI" stands for "Network Resource Identifier." So it sends back an identifier. And what is the Identifier? The Identifier is what we're talking about, this temporary identifier. And what does the mobile device do in this legacy system? It puts this Identifier in something called a "P-TMSI," which is -- stands for "Packet Temporary Mobile Subscriber Identity." And then the device uses this NRI to identify in order to avoid sending sensitive information permanently over the air. So as you heard, temporary ID instead of permanent ID is used for security purposes.

This next slide. Oh, that's how it works (indicating).

The next slide shows how the mobile device uses this P-TMSI and NRI when it moves geographically within the same network, so the same legacy network. So first the mobile device moves from one network to the other. Next, the mobile device connects to the base station in the new cell. Then the mobile device sends what's called an "access message" to the base station, and the access message includes the P-TMSI and also includes the NRI bits. So the base station looks at the NRI bits in the P-TMSI and determines that the mobile device is

registered among all these different SGNs to SGN1. Then the base station reroutes the connection to the SGN1.

Now, now I have an illustration here which gets to the area of the patent. So you have an LTE network that's in the blue, and you have the 3G legacy network. So the main difference between the LTE network and the legacy network, for our purposes here, is that the LTE network uses something called a "Mobile Management Entity," or "MME" to fulfill the role of the SGSN.

So you see up here on the right side the blue box is the LTE system and uses this phrase "MME," and the legacy system uses the phrase "SGSN." The MME, similarly a gateway to the external networks the same way as the SGSN, so those two terms are roughly equivalent between the systems.

Now, all of this so far is known in the art, and this just illustrates how it works (indicating).

You get back the MMI (sic) ID, similar to getting the NRI ID, and then the MM (sic) ID is put into the P-TMSI. In the legacy system it's called "Go10," or, I'm sorry, in the LTE system it's called "Go10." But for purposes of this patent, we're talking about transitioning from LTE to the legacy network. So this would be taking the MME-ID and putting it into the legacy network P-TMSI.

Quickly. Now, here's what the patent is talking about. So suppose a user moves from the LTE network to the 3G network,

so it moves from the current network to a legacy network. The mobile device sends a signal to the base station in the legacy network. It sends up its access message. The base station pulls out -- opens the package, and it pulls out the P-TMSI from the access message. The base station looks at the MME-ID, and then it reroutes it to the LTE network. So what the patent is talking about doing, generally, is you just substitute the NRI into the P-TMSI with the MME-ID into the PTSI (sic), and that's a point of distinction in that patent.

Unless there's any questions, I'll move on to '197.

THE COURT: Go ahead.

MR. VERHOEVEN: Just to frame this, the three patents here, '197, 246 and 003, are basically all the same invention. They have the same specification, the same figures, and they're all terminally disclaimed, so we're treating them as one patent or one group.

So this patent concerns cell reselection. So let's start with cell selection before we get to reselection.

So cell selection is when the user device sends a signal to LTE 1, in this example, and then the base station sends the signal back, and the UE, or the user device, says: *Have certain criteria been met*? And I think the other side uses a list, but these are things like is the signal strong enough, and technical aspects of the signal to say whether it wants to communicate on that base station. If it's "no," then the cell

phone then sends a signal to LTE 2. The signal comes back, and cell phone says: *Is the criteria met on this one?* And the answer is "No." So it switches to another cell. In this example, LTE 3 does the same thing. It comes back: *Are the criteria met*? "Yes." So it chooses LTE 3. That's cell selection.

Now, moving to cell reselection is -- this concerns, say, for example, the cell phones move geographically. So you already had a cell selection, and then you move somewhere, and it may want to select a new cell, so the signal may no longer meet the requirements. And that's cell reselection. But the same thing is true for cell reselection. There's many cells that are available, and so for reselection, the mobile device needs some way to prioritize the cells it should measure, and this is done with a priority list. And there are two types of priority lists, which Your Honor already asked a question about: There's the "dedicated priority list" and a "public priority list." For our purposes, we only need to understand the "dedicated priority list," so I'm not going to go into the other one.

So here, the way it works is the cell phone sends a signal, and it gets this "dedicated priority list" back, and then the cell phone moves, and, when the cell phone moves, it sends signals according to the dedicated priority list. It's hard to see, but in our example the list is LTE 5, LTE 8 and

LTE 4. So in our example, following the priority list, it first checks LTE 5 with the same methodology: *Is this criteria met on LTE 5*? "No." Then it goes next on the priority list to LTE 8: *Is the criteria met*? "No." Then it goes to the next item on its priority list and does the same thing, and then asks: *Is the criteria met*? "Yes." And then it selects the cell.

So turning to the patent, in the background technology -- so all of this is -- I should say all of this is background. So turning to the patent, it's talking about -- it describes this existing technology. So we've just presented an excerpt from that.

> (Reading) In the current LTE system, the terminal will first measure a frequency or system having a higher priority. If the cell or frequency or system having a higher priority meets the cell's reselection process, the cell will be reselected.

So that's what we just looked at.

Then it talks about the problem with the existing technology. And this is column one, lines 556 through 61, and they say:

> (Reading) In the existing technical solutions, the terminal performs cell reselection by using a "dedicated priority list" established by the non-mobile communications system. The access network or the Core

Network has to add more signaling for establishment of the dedicated priorities, which leads to higher costs for the network.

So this is the higher cost that you heard counsel refer to that this patent is designed to avoid, and it does that by not needing this additional signaling. And here's how it does it.

So first the mobile device starts out in an LTE network. I should have said -- sorry, I apologize -- I should have said the patents is talking about moving from one network to another just like the other patent. So this is talking about moving from LTE to some other network. And there's a GERAN network, which is GSM, there's the UMTS network, there's the LTE network. There's different networks that have different radio technology.

So, like the other patent we just looked at, this one is talking about cell reselection, and all that, but it's talking about when you move from the LTE to a legacy network. And that's why you need the extra signaling before the invention, because the -- previously the identification stuff didn't work in the other networks, unless you added more signaling.

So here, the mobile device moves, in our example -- so first the mobile device gets the dedicated priority list, and from the LTE network, but then the user moves to let's say the GERAN system. Then the mobile device connects -- so then the -- well, I think we might have a glitch there. The mobile

device realizes it can't connect using the dedicated priority list as received from the LTE network, so the mobile device then -- I didn't show the signal how it determined that, but it determines that, and then it sends the signal to the GERAN system, and the GERAN system generates a new dedicated priority list and provides the new dedicated priority list to the UE. So that's basically, without talking about the claims, what we're talking about here.

This is illustrated in Figure 1. Very simply, terminal -- the terminal -- and terminal in the patent is UE, the handset -- obtains a dedicated priority list from a first system. Cell reselection is performed according to the dedicated priority list when the terminal camps on a cell of a second system. And this is to avoid increased signaling.

So the next -- and here, if you look at the specification, it's talking about -- the dedicated priority list talks about moving from GERAN to UMTS to LTE, et cetera.

So here's what the patent is talking about. You get the dedicated prior list. Now, this is a list about systems, GERAN, UMTS, LTE. And then the user moves and contacts the GERAN system first, according to that priority list. *Is the criteria is met*? "No." Then it contacts the UMTS system, and it does the same thing: *Are the criteria met*? "No." And then it goes back to the LTE system: *Are the criteria met*? Yes, they are, because the phone was set up in that system.

So it's the same back and forth for all of these, cell selection, cell reselection, and then moving from different networks. And the point of distinction is you have this priority list among networks in addition to the prior art where you have priority lists among a single system.

So I think that concludes my presentation, unless you have any questions.

THE COURT: Great. Thank you.

MR. VERHOEVEN: So now we're done with the asserted patents by the plaintiff. I don't know if you want to take a break, but otherwise we'll turn to the asserted patents by the defendants.

THE COURT: I think we better take a break for the court reporter, if nobody else.

MR. VERHOEVEN: Okay.

THE COURT: So we'll take ten minutes, Mr. Bettinger.

MR. BETTINGER: Yes, Your Honor. Would it be possible for the folks in the audience if we could turn one of the screens around just so they could see?

THE COURT: Certainly.

MR. BETTINGER: Okay. We'll do that at the break. Thank you.

THE COURT: Thank you.

(Recess taken at 10:47 a.m.)

(Proceedings resumed at 10:58 a.m.)

THE COURT: All right.

MR. WHITEHURST: Good afternoon, Your Honor. Alan Whitehurst for Samsung.

If it pleases the Court, I'll be addressing Samsung's patents.

THE COURT: Great.

MR. WHITEHURST: I'll go to slide three. I believe you have a copy of the slides somewhere up there.

THE COURT: I do.

MR. WHITEHURST: Huawei has identified five terms from five of Samsung's patents. These patents are shown on the screen in front of you. All five of these patents have to do with the LTE standard.

Just to provide a quick overview, we're going to see a lot of overlap of what we already saw this morning. The first two patents, the '130 and the '726 patents have to do with fixing errors. The '130 patent has to do with protecting acknowledgment information. These are the ACKs and NACKs that Mr. Verhoeven previously mentioned. And the '726 patent is going to have -- is going to do with calculating a HARQ Process Identifier, and we've already discussed the HARQ processes.

The next two patents, if you look there in the middle of the screen, the '825 and '588 patents have to do with what's called a "shared channel." You could kind of think of this like a busy highway. Lots of phones are going to be sharing

the same channel. Now, whenever a phone initially powers up or moves to a new area, it has to initialize communications on a shared channel, and this is what the '825 patent is about.

'588 patent is a little different. It has to do with making sure that the phone doesn't miss important data on the shared channel. In order to save battery power, these phones are going to take naps, but they wake up periodically to check for data on the shared channel, and the '588 patent has to do with how long the phone wakes up for, and this is called the "active time period."

And finally, the '195 patent has to do with scanning control signals. In an LTE system, there are lots of control signals, and it would be inefficient to scan all of them, so the '195 patent describes a process where the phone can take its identifier -- each phone has a terminal identifier -- and use that identifier to limit the number of channels that it actually has to scan.

Now, to save time, I'm going to jump forward to slide 11 and dive right into the '130 patent. And if we look at the first slide, slide 12, you'll see this acknowledgment information that we talked about earlier today. The acknowledgment information is something that the phone is sending back and saying *hey, I got the packet*, or *something is wrong, please resend it*. And the '130 patent is about protecting this acknowledgment information.

If we go to the next slide, slide 13, you can see here the reference signal and the acknowledgment information, the *got it* or the *resend*. Now, in a HARQ process, the acknowledgment information is actually more important than the data itself, and there's a good reason for this. If there are errors in the data, you can use the HARQ process to actually fix the errors. But if there are errors in the acknowledgment information, the whole system, the whole process can break down. And so this reference signal, which we discussed earlier, is something that the transmission is going to use to fix the errors. And the '130 inventors figured out that the safest place to put this acknowledgment information was next to this reference signal, and that's what you see here on the screen before you with the acknowledgment information next to the reference signal.

Now, just to provide some background, you're going to see a series of arrows going back and forth. This green arrow is showing the downlink, which we already discussed today, and you'll see that there are errors when the signal arrives at the phone. But fortunately the phone is able to correct a lot of these errors, and if it does and it successfully corrects all the errors, it sends the ACK back.

But if you look at the next slide, slide 16, you'll see that there were two errors in this transmission that the phone was unable to fix, unable to correct, so in this instance it sends back the NACK.

Now, I'm not going to go through the HARQ process in detail, because we've already touched on that earlier today. But we see that in the HARQ process we have this back and forth. The same packet is retransmitted a couple times: You send the NACK, you get another copy, you combine them, once you combine them, hopefully you get the complete package, and if you do, you send the ACK back.

Now, one other concept that's important to the '130 patent is the reference signal. Mr. Verhoeven explained how the reference signal passes through the interference. And if you look on the screen here, you can see that this reference signal and the unknown data are passing through the interference. When it arrives at the phone, the reference signal has been distorted. The unknown data has errors in it. But what the phone can do is compare the distorted reference signal with the known reference signal to figure out what the interference is doing to the unknown data, and then it can use that information to better correct the errors in the unknown data.

And the same thing works on the uplink. You can take a known reference signal of unknown data in this transmission from the phone to the base station. The base station can use the known signal to figure out what the interference is doing and better correct the errors. And that's why we send a reference signal in the first place, is so that each receiver can do the error correction better.

Now, the reference signal can also be used for another purpose. The reference signal can be used by the phone to figure out whether it's on a good channel. It's a little hard to see in this picture, but you can see that the base station is transmitting these nice clean signals. Each of the bits is properly formed. When it arrives at the phone, it has been terribly distorted. So now the phone can tell that this is a poor channel, and it will send back a channel quality indicator letting the base station know that it's a poor channel. The base station can use this information; maybe it will use another channel; maybe it will aim to create the signal power.

We see the next thing on the next slide, but slightly different. In this instance, it's a good channel, and the phone lets the base station know this.

At this point I'm going to kind of change gears a little bit. On slide 22, I'm going to explain what the frame structure looks like on these transmissions, because this is something that's important to the '130 patent, and it's important to understand it.

And Huawei's counsel addressed this some this morning, but you have this frame that's ten milliseconds long. Now, within the frame there are subframes. They're each one millisecond, and there are ten of them. If you take ten one-millisecond subframes and put them together, you get a ten-millisecond frame. Now, within each of these millisecond subframes, there

what are called "slots," and each of these slots are half a microsecond long. But this is where it gets complicated.

If we look at slide 23, you'll see that LTE actually uses two different slot structures. If it's a strong signal, the phone can use a higher data rate with seven symbols, and that's what we see above the purple arrow. If you look below the purple arrow, you'll see what happens when there's a weaker signal: The phone uses a lower data rate with only six symbols in each slot. And LTE uses both of these slot structures depending on the strength of the signal.

Now I'm going to change gears and go back to the '130 patent itself and explain the invention better.

One of the important things that the inventors realized is, as I mentioned, that the control bits are more important than the data bits, and that's what you see highlighted on this passage. And they also figured out that the ACK and NACK bits are more important than the channel quality indicator bits. Now, the '130 inventors couldn't change the LTE frame structure. They were working with an existing structure, but they did come up with a better way to protect these ACK and NACK bits.

Now, if we look at the next passage from the '130 patent, here on slide 125, you can see another thing that the inventors realized. They realized that errors increased as you move away from the reference signal. If you're right next to the

reference signal, there are less errors, and the farther away you get, the more errors there are. So they figured out that the reference signal should be in one of the middle symbols, and that the ACK and NACK should be immediately next to it.

Now, if we look at Figure 10 of the patent, you can get an idea of how this could work. The reference signal, which is yellow, is one of the middle symbols. You'll see there "RS," and that's an abbreviation for "Reference Signal." You'll see it's crosshatched. And to help the Court we've highlighted it in yellow here.

Now, the ACK and NACK bits, which are solid black, we didn't do any additional shading. They are solid black in the original figure, and they're solid black there, and you'll see that they're directly next to the Reference Signal.

Now, the channel quality indicator bits are highlighted in green, and you'll see that they are spread out through the data transmission. And the data, which is purple, the channel quality indicator bits are multiplex, which is a fancy word for shuffling or interleaving. The channel quality indicator bits are shuffled into the data.

Now, if we look at Claim Nine of the invention, you can see how this all fits together, and you can understand things better. You can see that the reference signal is met to a middle symbol in the slot. That's what's highlighted in yellow, and that's what we just saw.

Claim Nine talks about the acknowledgment information. This is the ACKs and NACKs, and you can see that it's in directly adjacent symbols. The data is also in directly adjacent symbols, and the channel quality indicator bits are multiplexed with data. That's the purple and green part.

Now, on slide 30, if we go back to the LTE slot structure that we previously looked at, you can see what the inventors were working with and what this would have looked like. As we just saw, the reference signal is in a middle symbol of the slot.

If you go to slide 31, you can see that the acknowledgment information, the ACKs and NACKs, are in directly adjacent symbols. So in one instance above the purple line, this would be the third and fifth, and if you look at the sixth symbol slot, this would be the second and the fourth.

If you go to slide 32, you can see that data is also in these directly adjacent symbols. The ACK and NACK doesn't take up the entire symbol, so with the space that's left over, you put data in it.

And then finally on slide 33, you can see that the CQI bits are multiplexed with the data throughout the remaining symbols within the slot.

And that covers the '130 patent. So unless you have any questions, I'll move on to the '726 patent.

THE COURT: Go ahead.

MR. WHITEHURST: Going to slide seven -- excuse me.

Going to slide 35, you can see that this patent, the '726 patent, is about calculating a HARQ Process Identifier.

Now, if you have a video call, you don't just send the video all in one package. You break the video up into single frames, and that's what you're seeing here on the screen. You're seeing a woman that -- she's transmitting a video call, and you're seeing the first still image of this transmission. You can see it arriving at the phone. And unfortunately there are errors in the transmission, so the phone is sending a NACK back to the base station asking it to retransmit.

Now, what's going on in these transmissions is there are lots of HARQ processes going on at the same time. If it was just one, it would be easy. But unfortunately we have multiple HARQ processes. You can see here that we have a second still image. The woman's face is at a slightly different angle. It's the next still frame in the video. And you can see that it's arriving at the phone. And just like we saw for the first packet, the second packet has errors as well, and that's why the phone is going to send back a second NACK.

But here's where the problem arises. This is where things get interesting. When you've got lots of HARQ processes going on at the same time, you've got HARQ Process 1 and a HARQ Process 2, sometimes these retransmissions arrive at the phone about the same time, and that's where the '726 patent comes

into play. It's a way that the phone can figure out which packet goes with which HARQ processes, so that it can combine the incoming packet with a stored copy, try to put them together, and try to fix all the errors so they can successfully get the package.

Now, the '726 patent pertains to something called "persistent resources." For large amounts of data like video calls, LTE uses what are called "persistent resources" to send the data. These are particular frequency bands and time slots that are reserved for the data. The more data you're trying to get through, it's nice to have these set resources that you can use. But the tricky part is when you're using these persistent resources, the base station gets rid of the headers that would normally be on the packets. In most HARQ processes there's a header that tells you this is HARQ Process 1, this is HARQ Process 2. But when you're using these persistent resources, because you're trying to get more data through, you strip these headers off, so that information is no longer there like it normally is. If the packets were numbered, it would be easy. But in this instance the headers are gone, so you need the '726 invention.

And this problem and this solution that the inventors came up with is shown in Figure 1 of the patent. You can see here that we're talking about the persistent resource interval. This is where you take the headers off, and you're trying to

get more data through.

Now, this is the first packet that we just saw. It came in, it had errors. The phone is sending a NACK back, saying *hey, I need another copy of this packet*. So the base station retransmits the same packet as before. That's in reference number 120. Unfortunately, the second copy is still corrupted, so the phone is going to send back this NACK 125. That's the second resent message. And this process continues.

Now, in HARQ Process 1, when you get the third packet 135, it's still corrupted, so the phone sends back this third NACK. But now you're getting into the second persistence resource interval, and this is where the second HARQ process starts, and this is the slightly different picture that we saw before where the woman's face is at a different angle. When the packet arrives in the second persistent resource interval 145, the phone sends back the NACK for a different HARQ process. That's NACK 150. And then we see at reference numeral 160, here's where the problem arrives. A new packet comes in, and the phone has to figure out whether this is HARQ 1 or HARQ 2.

Now I'm going to turn to the patent to see what the patent says about this. You can see here on the screen a passage from column eight of the patent. The '726 inventors figured out that you can calculate the HARQ Process Identifier using three variables: I, N and T. I is the length of the interval. That was the Persistence Resource Interval which we saw highlighted

in yellow. It's actually in units of ten milliseconds, but it relates to the length of the interval. N in the number of processes: How many HARQ processes do we have going on at the same time. In this example we were just walking through, we had two, but you could have a higher number of HARQ processes that are going on at the same time, and that's N. And then the third variable is Time information, and that comes from the equation 1, which is in the first part of this passage. You'll see that here in column eight of the '726 patent we have two equations: Equation 1 and equation 2, and the HARQ Process Identifier is a function of I, N and T.

Now, just like we did before, if we go and look at the claims, we can see how this is expressed in the claims. You are calculating a HARQ Process Identifier using three variables: The Number: How many HARQ processes are there; the Interval information: How long is the Interval; and then the Time information. That's what comes from equation 1.

Now, the patent has another equation, equation 3, and we see this in the specification in column nine. What we were just looking at comes from column eight. You have equations 1 and 2, you keep reading R, and you get to equation 3 in column nine. And equation 3 is a more specific example of how the I, N, and T can be used to calculate the ID. And the next couple of slides are going to explain how equation 3 works.

If we look at slide 46, you'll see that the variables I

and T, this is the Interval and Time information, are used to calculate S. T is divided by I and then rounded up to the nearest integer. This is what Huawei's counsel mentioned earlier. This is the ceiling function. These are the brackets where you only have them on the top but not on the bottom.

And so in this example that the patent is providing in equation 3, it's using the ceiling function. So if you had a number like 2.4, if you're using the ceiling function, you go up to 3. It doesn't mean you're necessarily going to the closest whole number, you're just automatically going up. So if you have 2.4, you go up to 3. Now, once you divided T by I and you round up, you get the output S. And the point here is you're not -- it's not so much that you're using the ceiling function, but that you want to get a whole number. You could also use the floor to go down to the lower number. You could round up. There are other ways to do it, but in this specific example you're using the ceiling function to automatically go up.

If we go to the next slide 47, we can see how equation 3 continues. The output S in this other variable number of processes N are used to calculate an index. And the way equation 3 does it is S is divided by N, and then the remainder is the index. This is called the "mod function". "Mod" stands for "modulo," and it's another name for remainder.

So, for example, if you took 11 and divided it by 3, you

would -- the 3 would go in three times to 11, and you would have a remainder of 2. So if you were using the mod function, the remainder of 2 would be the output, and that's what's going on here.

And finally, on slide 48, you see that the index is then used to get the ID.

Now, if we go back to the claims, if you look at dependent Claim Four, you can see that Claim Four is mentioning this integer S. It doesn't say you have to use the ceiling function, just that it is an integer that is derived from T divided by I. It also says that the ID is calculated using the modulo function. That's what we just saw in equation 3. And the ID is calculated using the remainder when S is divided by N.

And just one final slide. If you put Claims One and Four side-by-side, you can see how they're different. If you look on the left-hand side of the screen, you will see -- well, you'll see that they both mention I, N and T. These are the three variables that are highlighted in green. But if you look on the left-hand side in Claim One, you'll see that it says the ID is calculated using the three variables. Well, if you look on the right-hand side of the screen, you'll see that Claim Four mentions S and the modulo function.

And that concludes my presentation for the '726 patent. I don't know if you have any questions; otherwise I'm going to

turn the floor over to my colleague, Mr. Zado, who is going to address the '825 patent.

THE COURT: All right.

MR. ZADO: Good morning, Your Honor. Ray Zado on behalf of Samsung.

And the next patent we'd like to discuss today is the '825 patent that relates to initiating communications on a shared channel.

So you heard a little bit about shared channels earlier today, but essentially shared channels are used by multiple UEs to communicate with the NodeB. So you can think of it like, as my colleague Mr. Whitehurst said, as a highway where you have multiple UEs sending data over a shared uplink channel to a NodeB or a NodeB sending data down to multiple UEs.

Now, because multiple UEs can receive data or send data over a single shared channel, there needs to be some way to uniquely identify each of the UEs so you know which is the intended recipient or the sender of data over that channel. And the way this is accomplished, in the context as described in the '825 patent, is by using what's simply called a "short ID." And a short ID is a unique ID that's assigned to each UE within the cell, as reflected in the ID numbers here on the representative UEs on the left-hand side.

Now, the IDs need to be short, because these IDs have to be included within each message or packet of data that is sent

over the shared channel. So in this example you can see this is a shared downlink where the NodeB is sending data to a UE. There's a message or a packet of data that includes a particular short ID number there. It's the 1742. Because that ID is included in the packet, then the UE with the corresponding ID number 1742 knows the packet is intended for that UE, and correspondingly, the other UEs know that that packet is not intended for those UEs.

Now, before data can be sent over a shared channel, there's some housekeeping or setup work that needs to be done, and this includes assigning the short ID to the UE. I'm going to walk through that process over the next few slides.

So the first step in this process is the NodeB has to send system information to the UE, and the system information is basic information about the characteristics of the NodeB that allow the UE to send data over the network.

After receiving this system information, the UE can then use that information to send a message that's called an "initial uplink message" to the NodeB. And what the initial uplink message does is it informs the NodeB of the presence of the UE, and then requests the use of a shared channel. And this message is sent over a special kind of channel for this purpose referred to as the "Random Access Channel."

Now, after the NodeB receives that initial uplink message, it processes the message, and then it can assign a unique ID,

or the short ID, to the particular UE, and then sends a response message that includes that assigned short ID. And in the prior art this was generally sent in the message column, initial downlink message.

Now, prior systems before the '825 patent weren't able to send this initial -- this response message, including the assigned short ID on a shared channel. Rather, they had to use a special type of channel for this purpose, which was called the "Forward Access Channel," or the "FACH."

And so with the '825 patent, by contrast, that describes systems to -- or systems and methods to initiate communications with the NodeB, but don't require the use of this special channel, but instead allow for the response message to be sent over the shared channels, which are used for other communications within the system.

And this technique uses what are called "pools" or groups of temporary IDs as part of setting up the communication with the -- with the UE and the NodeB. And I'll describe that a little bit more in the next few slides.

So first, as you heard earlier, the NodeB sends system information to the UE, but in the context of the '825 inventions, this system information also indicates pools or groups of temporary IDs from which the UE can randomly select.

After receiving this system information, the UE then randomly selects one of the temporary IDs from the indicated ID

pool, and then it prepares its initial uplink message, and it includes in that initial uplink message the temporary selected ID. And this is also sent over the Random Access Channels similarly as was done previously.

So after the -- after the -- after the NodeB then receives the initial uplink message a couple things happen. So on UE side, the UE starts monitoring the control channel for a response message with that selected temporary ID. And then on the NodeB side, the NodeB receives the message, processes the message, assigns a short ID to the UE, and then sends the response using that temporary ID in the process of assigning the dedicated short ID.

And the '825 patent discloses a couple different ways to do this, and there are two examples here. On the left-hand side is the embodiment, is Figure 4. There's a first message that's sent from the NodeB to the UE, and that includes the temporary ID, which is sent over the shared control channel, and this message informs the UE that it should expect a subsequent message on the shared downlink channel, and then the follow-on message the NodeB sends to the UE initial download message that includes the temporary ID and the dedicated short ID.

The Figure 9 process works a little bit differently, but it accomplishes the same purpose. In figure -- as is disclosed in Figure 9, the NodeB sends a single message over the shared

control channel, which includes both a temporary ID and the dedicated short ID that's been assigned to the UE. So the two embodiments describes a little bit of a different process, but the same goal is accomplished. Essentially you're assigning the short ID to the UE over a shared channel.

And after the dedicated short ID has been assigned to the UE, then that dedicated short ID can be appended to and used for all subsequent communications on the shared channel between the UE and the NodeB.

Now, there's a potential issue, though, that can arise with the use of these temporary ID pools and the selection of temporary IDs, and I'm going to try and explain that through this animation. Specifically, if two UEs select the same temporary ID from a temporary ID pool at around the same time, and I'll show you in this example, you can get a problem that's called a collision.

So in this example, we have a first UE sends its initial uplink message into a selected temporary ID number of 12, and at that time it sends the message it also starts monitoring the control channel for a response from the NodeB with a message with that temporary ID number. The NodeB then receives the message, starts processing it, and starts generating that response message that should be directed to the first UE or the UE-1. However, then a short time afterward, in this example, a second UE, or UE-2, generates its initial uplink message, but

it also -- it happened to randomly select the same temporary ID, this ID number of 12. So it sends its initial uplink message with the selected temporary ID, and it also starts monitoring the shared control channel for a response message with that ID.

Now, the NodeB then finishes processing the first initial uplink message from UE-1 and sends a response over the shared controlled channel with that temporary ID number of 12. But the problem that you have here is that both UE-1 and UE-2 are monitoring the shared control channel for that kind of response message with that temporary ID, and, as a result, both of them receive the message, think that the message is intended for them when it's really only intended for the first UE, and this is referred to as a collision.

But the '825 patent also discloses how to address this potential issue of collisions, and specifically what the '825 patent talks about is instead of monitoring the shared channel right away after sending the initial uplink message, what you should do is you should wait for a period of time before you actually start monitoring the shared control channel. And this period of time is called in patent a "delayed duration" or "Delayed Duration T," as reflected in Element 610, and here it's Figure 6. So you can see during that period the UE that has sent the initial uplink message is not monitoring a shared control channel. After that period of time is expired, then

there's what's called a "Valid Period P," and during that valid period is when the UE is monitoring the shared control channel for the response message from the NodeB with the temporary ID, and they can receive and process the message.

And the reason that this delay period works to help prevent collisions is because it takes a little bit of time for the initial uplink message to get to the NodeB, so the NodeB can process it and assign a short ID, and then send a message back down to the UE. And because you know that there's a certain period of time that it's going to take for all that process to take place, any message that comes within that period of time couldn't have been intended for that UE. So you can basically ignore any messages that come in during that period of time. So by adding this delay, the UE avoids processing these unintended messages which can cause problems, or specifically can cause collisions.

And at some of the embodiments of the '825 patent, they refer to this delayed duration as a "predefined delayed duration." And this operation is reflected in the '825 patent claims where you can see that it refers to waiting a predetermined delayed duration without checking a downlink channel, and then after waiting for that delayed duration by checking the downlink channel by the valid period.

So in this animation we're trying to illustrate how this process actually works to help prevent collisions on that

shared control channel, which is going to have a similar set to the prior slide. First, in the same way with the prior slide, you have an initial uplink message in which the UE has selected a temporary ID number of 12, and at that time, unlike the prior animation, it doesn't start monitoring a shared control channel right away. Instead, it waits for a period of time before it starts monitoring. That's reflected by that "T" on the bottom of the animation. So then the NodeB receives that initial uplink message from UE-1, and starts processing the message.

Now, a short time afterward, UE-2 sends its initial uplink message with its selected temporary ID number of 12, but it also starts waiting its delayed duration for a period of time T.

Now, after the first period of time T for UE-1 has expired, UE-1 starts monitoring the control channel for a response message. So the NodeB now has had enough time to finish processing UE-1's initial uplink message, has generated a response, and sends the response message with that temporary ID. So UE-1 can receive the message and process it appropriately.

Now, by contrast, the UE-2 is still within its period where it's delayed where it's waiting to monitor the control channel, because it's still within its delayed duration. As a result, because it's not monitoring the shared control channel, it doesn't receive the message, and it doesn't start processing

it, and as a result there's no collision.

And unless you had any further questions, that is my presentation, and I'll hand it over to Mr. Whitehurst.

THE COURT: Great. Thank you.

MR. WHITEHURST: Three down, two to go.

The next patent is the '195 patent, and I'm going to dive right in with slide 71.

As I mentioned before, in an LTE system there are lots of possible control channels, but it would be very inefficient for the phone to scan all of these channels. It would waste battery time. It's more processing power. It's a lot easier to monitor a smaller subset than to monitor all of the possible control channels.

Well, all of the phones had an ID. This is what's highlighted in yellow, the ID of the terminal. And in the '195 patent, the NodeB and the phone use this ID to limit the number of control channels that the phone has to monitor. So if you look at the right-hand side of the screen, the NodeB is going to take this terminal ID and use it to select just Channels 2, 3 and 6; and if it has control information for the phone, it's going to transmit it on just these three channels.

Well, meanwhile, the phone takes this exact same ID, runs the algorithm, figures out all I have to do is monitor Channels 2, 3 and 6. So by doing this the phone can monitor or scan less channels than it otherwise would. It saves processing

power. It saves battery power.

Now, to provide some additional background on the '195 patent, control channels are formed using Control Channel Elements. These are often referred to as "CCEs." The number of CCEs depends on the strength of the channel. If it's a strong signal, you can use a single CCE. That's what's shown on the top arrow on the screen. If you have a weaker signal, then the NodeB has to use a lower data rate and multiple CCEs, and that's what we see on the second arrow. There might be two, four or even eight CCEs.

These slides are showing the same concepts that we previously saw. The base station -- there are lots of different control channels that could use these red arrows or showing this point that's going from one up to some number N. But as we previously discussed, in an LTE system the UE has an identifier, and both the base station and the phone know this identifier. So as we previously discussed, this identifier is used to restrict the number of control channels that the base station actually uses in the phone monitors.

This is what we see in the claim highlighted before you. We're determining a set of control channel candidates, and you'll see highlighted in blue based on an identifier ID of the terminal.

Now, we see this throughout the patent. You'll see here on the screen we have column seven as well as Figure 7. Column

seven is talking about the monitoring set. This is the set of control channels that the UE monitors, and it says that the monitoring set is determined by the terminal ID. That's what you also see on the right-hand side in Figure 7. We also see this in column eight in Figure 9 where once again it's talking about the monitoring set is determined by the terminal ID. And if you look at Figure 9, you'll see on the right-hand side highlighted in yellow is the monitoring set, and the blue box mentions using the terminal ID to get this monitoring set.

One last slide, slide 79, column six in Figure 5A, we see the same thing again where it's talking about the monitoring set. Column six provides an example where there's seven possible channels, and the monitoring set is only four of those seven channels. And it says that the monitoring set is reduced according to a predetermined role where the predetermined role is the identifier of the terminal.

So that was pretty quick.

THE COURT: Yes.

MR. WHITEHURST: One last patent to go.

THE COURT: Okay.

MR. ZADO: I'll try to wrap it up quickly as well, Your Honor.

So the final patent we're hoping to discuss today is the '588 patent, which relates to controlling an active period during a discontinuous reception, or DRX operation.

Now, a DRX operation is a way to save power in a UE by alternating periods of time when you have the UE and its receiver on and when you're turning the receiver off. So as shown in the figure here, you can see these green portions are periods of time, and that's what I would refer to as the active period. When the receiver is on, the alternating period would be these yellow periods where the receiver is off. And by keeping the receiver off, that's how you can save power.

And just some background concepts. One of these alternating on/off periods is called a "DRX cycle." And in conventional UMTS or 3G systems, the active period of a DRX cycle is preset to a fixed time of ten milliseconds.

Now, however, in the context of an LTE system, this conventional DRX operation wouldn't work, and this is because in an LTE system, data is generated and shared between the UE and the NodeB as part of a set of operations, I'll call it a high level, which I'll refer to as "services;" and depending upon the type of service, you have a variable and an unpredictable amount of data that needs to be sent between the NodeB and the UE in a given DRX cycle. So if you had a fixed "on" time for the DRX cycle, then what could take place is that because of a particular service, there may need to be more data that needs to be sent within that DRX cycle, but the UE is not "on" to receive it.

And so what the '588 patent describes is a system and

methods to address this particular issue of how to combine conventional DRX operation with the LTE requirements of the LTE system, and to do this they describe system and methods that alter or vary the length of the active period when needed.

And as you can see here in the Figure 3, on the right-hand side you see what's the shortest of the green bars that designates the active period. And there's no indication there's any packet data that's coming in during that period of time, so the length of that active period is referred to there as the "minimum active period." And by contrast, in the middle active period, reception period, designated by 320, you can see that the length of the active period has been extended, because there are additional packets of data that are coming within that active period.

Now, the '588 patent accomplishes this varying of the active period by using this set of two timers. And the first timer is referred to as the T Minimum Active Timer. That's a timer that sets the minimum amount of time that the UE is going to be active or the receiver is on during a DRX cycle. So at the start of a DRX cycle, then you turn on the first timer, and if there's no indication from the NodeB during the running of that timer that there's data coming in to the UE, at the expiration of that timer, then the receiver turns off, or you enter what's called "sleep mode."

And that's illustrated in this animation here. So we have

the first timer. At the start of the active period, the first timer starts running. There's no indication from the NodeB that there's any data that's coming in. The first timer expires and runs out, and then the UE can enter sleep mode.

However, if there are packets -- if there is an indication from NodeB that there are packets to receive during that DRX cycle, there's a couple things that happen. First is, of course, the UE is going to be receiving the packets that are coming in; but, second, when the UE gets that indication, it's going to start a second timer, and this timer is called a T Active Period End Timer. That timer is used basically to extend the "on" time during a given DRX cycle. So each time that there's an indication from NodeB that there's a packet of data received that are coming in, then that timer is restarted. So then this process continues until all the packets have been received. And you can see that's reflected in the feedback loop in Figure 6 where you're restarting the timer when that new packet data comes in.

And then once all packets have been received, there's no further indication from NodeB that new packets are coming in, the second timer expires, and then you can move to proceed to entering into sleep mode. And this animation hopefully helps illustrate that operation.

So, again, as in the prior example, at the moment you enter into the active period, you start the first timer. The

first timer starts running. The NodeB sends an indication that there's some data that needs to be sent during that DRX cycle. The UE stays active, starts the second timer, and the second timer starts running. The NodeB then in this example sends another indication there's some more data that's coming in. The UE can -- restarts the second timer and it continues to run. The UE remains in active period. Second timer then -- there's no further indication data is coming in, the second timer expires, and then you can move into sleep mode.

Now, just a minor final point I want to address is how the UE enters sleep mode when the second timer expires. There's a couple different ways that that can take place, and it depends upon -- it depends upon the HARQ processes that you heard earlier about with respect to a couple different patents, and specifically when packets need to be retransmitted that haven't been transmitted correctly.

So in the first method, the UE restarts the second timer only when the packet of data -- there's an indication that the packet of data that's coming in is a new packet. So once the second timer expires, the UE still needs to complete the HARQ process to get new packets, and they need to be retransmitted that haven't yet been properly accepted by the UE. So the UE needs to keep the receiver on or stay in the active state until those HARQ packets have been transmitted and processed and the HARQ process is completed. And then after that, after that

HARQ process is completed, then you can enter sleep mode.

In the second method, the UE actually restarts the second timer, if the packet received is either a new packet or a retransmitted packet. And so in the second method, instead of having to wait for HARQ processing, you know, HARQ processing to finish and then you retransmit packets, because for each retransmitted packet, you are restarting the second timer, if -- once the second timer expires, there will be no further indication then coming from the NodeB that we're going to try and send the retransmitted packet, we can assume that the NodeB has given up, and can enter into sleep mode.

And that's it. So thank you, Your Honor.

THE COURT: Great. Thank you.

Mr. Bettinger.

MR. BETTINGER: Yes, Your Honor. Brief response on the five patents.

THE COURT: Please.

MR. BETTINGER: The way we've handled it, Ms. Yang will handle the '825, '588, and '726, and Mr. Lewis will do the '195 and '130.

THE COURT: Terrific.

MR. BETTINGER: We'll keep the comments brief.

And if you are interested, it begins at page 83 of our presentation. Thank you.

THE COURT: Okay. Thank you.

Ms. Yang.

MS. YANG: Thank you.

So now that you've been promised brief remarks, so I'll do my best to comply.

All right. So going back, let's start with the '825 patent, which is in the middle of the group that Samsung discussed.

So just for a little bit of context, the '825 patent is directed to the initiation of communications on a shared channel. It applies -- this concept applies to both the uplink and the downlink.

So in the prior art when communications are being initiated between a UE and the base station, first you have system broadcast information that's sent from the base station to the UE. It's broadcast to all the UEs. It includes various parameters like a list of neighbor cells, et cetera, that are used by the UE to initiate communications. Then a UE will send a message up to the base station with an ID using what's called a "Random Access Channel," and this is called an "Initial Uplink Message." And then the base station will send a message back down to the UE with an ID. And basically, if the UE is associated with the uplink and the downlink match, then you know that you're ready to transmit and receive data between the UE and the base station, because you've got a channel that they can communicate on.

So the problem with the prior art -- and counsel went into this, so I'll just go over it very, very briefly.

So in the prior art, the UEs can pick temporary IDs for their uplink messages. So in this case, for example, UE-1 has picked temporary IDX, and then each UE is listening for downlink messages with that same temporary ID. So if you have two UEs that wanted to access the network, it's possible that they could pick the same temporary ID. Here, for example, UE-1 and UE-2 have both picked temporary IDX. So if a downlink message comes in with a temporary ID that both UEs picked, you don't know which UE that message is for, and that's called a collision.

So in the '825 patent, the first UE sends its initial uplink message using a temporary ID -- here we're using X again -- that it has selected from some pool of temporary IDs. And then the UE does not monitor the downlink channel for some time period, called the Predetermined Delay Duration, immediately after sending that uplink. And then after waiting that time period, the UE-1 can start to monitor that downlink to check whether there's a corresponding downlink signal with that temporary IDX for it. And this time period where the UE is not monitoring the downlink is dependent on things like the capabilities of the base station or maybe capabilities of a particular UE.

And so you can think of the Predetermined Delay Duration

for UE-1 and UE-2 as if you're sending off a job application. You've got two employers. You're applying to both. They're both busy. Therefore, the first employer says *great, you're not going to get a response for two weeks*. The second employer says *you're not going to get a response for three weeks*. So you know that you don't start checking for a response from the first employer for two weeks. You know you've got three weeks to wait.

So if the second ID also selects temporary IDX, the idea of the '825 patent is that it would not be checking the downlink for a message with that same temporary IDX at the same time as the first UE. But if it turns out that UE -- the second UE with temporary IDX is monitoring at the same time as UE-1 with temporary IDX, you could still have a collision. But using the '825 patent, the time and the probability of having a conflict is greatly reduced. It doesn't completely guarantee there will be no collision, but by introducing this Predetermined Delay Duration, it reduces that possibility.

And so a little preview for next week, again, the issue for claim construction is whether that predetermined delay duration in the '825 is provided by the base station.

I think that was under five minutes.

All right. So the '588 patent --

THE COURT: You only get points when you stop.

(Laughter)

MS. YANG: Okay. I'll just keep going.

All right. So the '588 patent, for context, this one addresses downlink from the base station to the UE. And so just as a reminder, this was the last patent that Samsung's counsel mentioned, and this deals with Discontinuous Reception Operations.

And so the patent explains what a DRX is. It says the UE in an idle state will wake up at a predetermined time; it will monitor a predetermined channel for a predetermined period, and then it will go back to sleep mode in an idle state. So in the prior art, the UE and the base station agree on when an active period will be, and when the sleep period will be. And so during the active period the UE receiver is on, and the UE is performing normal reception operations.

Here, in this figure, the yellow rectangles depict the active period, the green period of time depicts the entire DRX cycle, and that white in between is where it's asleep. And hopefully it's not confusing, because I did notice that Samsung's counsel used exactly the same colors, but sort of flipped. So in this one at least the active period is depicted by the yellow.

So the issue with this approach in LTE is due to the nature of LTE. And LTE, just by the way it was set up, is much more data intensive. And so the problem is that the UE needs to be able to stay awake while there's more data coming,

because under the old system it would just cut out when that active period ends, and we want to avoid that.

So the '588 patent is directed to defining a DRX operation for use in LTE. In the '588 patent, you have Timer 1, which in that patent is called "T Minimum Active," and that is started periodically. So the UE, when Timer 1 is running, the UE will be active, or it will be awake, and it will see if there's data coming for it. If there is data coming for the UE during that time period, then Timer 2 starts, and in the patent that's called "T Active Period End." And Timer 2 is used to extend that active time period, the time that the UE is awake. So the effect of this is that the UE stays awake as long as Timer 1 or Timer 2 is running. And then after both timers have expired, then the UE will go back to sleep.

So in this figure you can see that in the first active period there are no data packets for the UE, so the UE just stays awake, and then it goes back to sleep when Timer 1 ends. In that second active period in the middle there, there are data packets, so when that first data packet comes in, Timer 2 starts; and then when it receives the indication that the last data packet has come, then Timer 2 knows that it can end. So at this point both timers have stopped, and the active period is over, and this allows the UE to save power without cutting out in the middle of a transmission. And so in order to save power, then it's advantageous for the UE to be in sleep mode as

long as possible, which is why it's important that the timers expire to let the UEs go to sleep.

So the dispute in this case for claim construction next week is over the preamble and the independent claims. And so Huawei's position is it's indefinite, or, alternatively, that it means monitoring control data on a shared control channel during a DRX operation only between the start of a first timer and the expiration of a second timer. And Samsung's position is that the term does not require construction.

All right. Moving on to the '726.

So this patent addresses concepts that are used in both the uplink and the downlink. And so the first one that I want to touch on is the concept of persistent resources. So the patent explains that "persistent resource" refers to transmission resources that are periodically allocated to a particular UE without separate allocation information.

So real world analogy, you know, for example, you have a conference room. It gets scheduled for a weekly meeting every week. And so in that case, the conference room is your resource. It's getting reused at a set interval that doesn't have to be like renegotiated every week. You just know that's when you get that conference room. And that's kind of our analogy for "persistent resource."

So the next concept is HARQ, which you've heard about, so I won't dwell on it too much. But basically the idea is that

in LTE, the data packets can get corrupted as they travel over the air. So HARQ processes are used to check for corruption of patents -- packets, excuse me, on either the uplink or the downlink, and then try to fix them.

So here, we are depicting corrupted data packets just with the jagged red part. Those are the corrupted packets. The blue ones are the packets that are okay.

And so the idea of HARQ processes actually came up in 3G, but, again, because LTE had so many more data transmissions, that's where it has really become useful.

So in the HARQ process, if the UE gets a corrupted data packet on the downlink, for example, it will send back a negative acknowledgment to the base station that basically says: *I didn't get it. I didn't get the packet successfully. You need to resend it.* And then after receiving that, the base station will retransmit it, and it will actually retransmit a slight variation on the data, which is depicted here by that little yellow variation on that blue rectangle. And so the idea then is that you can combine that first transmission and the retransmission, and then that gives you a better chance of recovering what was originally intended.

So when -- so an associated concept is a HARQ Process ID. So when the UE receives a packet -- and here, just as an example, I'm just using downlink -- it will determine which HARQ process is going to handle that packet. And so you can

think of it as a HARQ process is like a worker who gets an incoming packet and then deals with it. Each of those processes or each of those workers has an ID called a "HARQ Process ID" which identifies the process that goes along with it, and it's numbered from 0 to 7.

And so, for example, if your first packet comes in and HARQ Process 5 or Worker 5 is available, then the HARQ Process ID of that packet is going to be 5. If the second process comes in and 0 is available, then your HARQ Process ID will be 0. And on the downlink it's whatever, you know, whatever process or whatever worker is available that is going to get assigned to handle that data packet, so it's asynchronous. You don't have to go in order from 0 to 7.

And this is not really -- you know, just kind of as an aside, on the uplink they actually do have to go in order, so it's synchronous on the uplink.

And so then the '726 patent talks about putting these ideas together, persistent resource and HARQ processes. So the patent explains what the term "persistent resource dedicated HARQ process" is, and it says that it refers to a HARQ process which will be used for a HARQ operation of a packet received through persistent resources. And so when persistent resources are used, that initial transmission actually does not include a HARQ Process ID. So when you have -- you know, if you send back a negative acknowledgment and you need to retransmit that

packet, it's not clear which packet to combine. And so then the question is how to determine what that HARQ ID is for that initial transmission so that the retransmitted packet, which does have a HARQ ID, can be combined with the initial transmission.

So the question for the *Markman* is how to calculate the HARQ Process ID of the initial transmission. And counsel for Samsung mentioned equation 3, and because they spent some time discussing that calculation of equation 3 that's disclosed in the specification, I won't step through it here. But for purposes of claim construction, Huawei's position is that the patent discloses what is shown on this slide, this equation, as the calculation for HARQ Process ID and Samsung's position is that no construction is necessary.

THE COURT: Great.

MS. YANG: And with that, I'll turn it over to Mr. Lewis.

THE COURT: Thank you, Ms. Yang.

MR. LEWIS: Your Honor, I'm going to skip virtually all of my presentation and just make like a couple of points.

THE COURT: Excellent.

(Laughter)

MR. LEWIS: So for the '195 patent -- I'm doing these in the opposite order, just because it's the way our slides were put together -- for the '195 patent, I'm going to skip

through all these, and I just want to make a couple points about this slide.

Counsel showed you this figure. I just want to make sure Your Honor understands what it shows, because it's a little conceptual. First of all, the little boxes are Control Channel Elements, and the vertical are control channels, so this talks about the control channel candidate set as that entire group, but it's the vertical that are the control channels themselves. So you have the control channel candidate set, and then you have the monitoring set, which is a subset of the control channel candidate set, as it shows.

As a preview for next week's dispute, we dispute the term "Control Channel Candidate Set." It's phrased a little bit different. It's "Set of Control Channel Candidates" in the Claim, and whether that means essentially monitoring set or whether it means all of the control channels, and we'll get into that next week.

For the '130 patent -- I, again, will skip most of these slides -- this one Samsung provided in their brief the analogy of an airline seat, so I circled that one there as being in the middle. The parties appear to agree that an even number of symbols in a slot have a middle. We proposed a construction, and Samsung doesn't like it. You know, we're open to, you know, working next week or in the meantime to get a construction that's agreed upon.

But, so anyway, the dispute next week I think will be less about what this means and whether an even number of symbols can have a middle, but, rather, should it be construed or not, and, if so, what. But we'll tune in next week for that one.

THE COURT: Great.

MR. LEWIS: And Your Honor, with that, I don't have anything else.

MR. MCBRIDE: I just have a brief housekeeping matter.

THE COURT: Come on up.

MR. MCBRIDE: All right. Thank you, Your Honor.

I just noticed a printing error on the slides, on the slides for the '166, and it's -- you know, should you be keeping this on your nightstand as a cure for insomnia and pick it up and be flipping through it, on slides 39, 40, 41, 42, and 43, there's an arrow shown between that SGSN to the MME, but of course that's the big payoff in slide 45. So, again, in slides 39 through 43, we have this arrow between the SGSN and the MME that really shouldn't be there until slide 44.

THE COURT: Hang on just a second.

MR. MCBRIDE: Sure.

THE COURT: Okay. So say that again.

MR. MCBRIDE: So yeah, so on pages --

THE COURT: So the arrow -- I shouldn't be looking at the arrow until slide 45?

MR. MCBRIDE: Until slide 44, Your Honor, yes.

Starting from that arrow from SGSN to MME in slide 39 through 43. I don't know. I think that might have been just an artifact of the animation we used.

But thank you, Your Honor.

THE COURT: Okay. Great.

All right. Thank you, all, very much.

And one thing I really appreciate is that you kept your advocacy to a more minimum than I usually get in tutorials, and so this was actually very helpful.

So thank you, all. And I will see you on the 18th.

ALL COUNSEL: Thank you, Your Honor.

(Proceedings adjourned at 12:00 p.m.)

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CERTIFICATE OF REPORTER

I certify that the foregoing is a correct transcript from the record of proceedings in the above-entitled matter.

DATE: Tuesday, August 15, 2017

Rhonda L. Aquilina, CSR No. 9956, RMR, CRR
Court Reporter